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GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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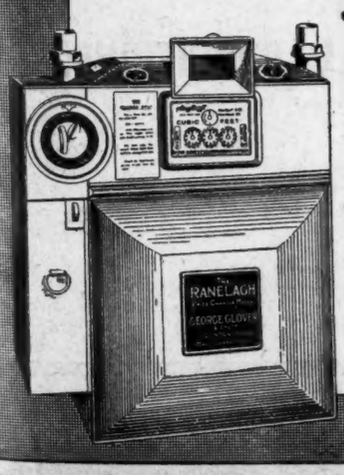

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EDITORIAL NOTES.

Amendments of Standard Prices.

ONE cannot pointedly ask the Director of Gas Administration whether or not, in making amending Orders with reference to standard prices, he is going to recognize the principle of an allowance in respect of the economies that have been effected through efficient and skilful management—that is to say, those economies that are brought about other than through the easier conditions in regard to costs of materials, labour, and rates and taxes. But it would be of great advantage to gas undertakings to be guided by some pronouncement on the subject. It will be remembered that the point was raised in the inquiry into the reduction of the standard price of the Gas Light and Coke Company. As announced in our "Miscellaneous News" last week, the amending Order has been issued; and the notified standard price of 11d. per therm stands. That is a reduction of 4·2d. from the standard price fixed under the conditions ruling in 1920. But the 11d. leaves us in the dark as to whether or not the Director has made any allowance in respect of the claim of the Company. On their figures (if he accepted them as correct), he has not done so; on those of the London County Council (which were the subject of criticism at the inquiry) he has allowed 0·2d. The County Council submitted that the new standard price should be 10·8d. per therm; the Company held that 11d. was the right figure, and that 0·4d. should be added to give the Company some advantage from the economies which had been made in working through efficient management. As we have before indicated, if only the additional costs of manufacture since 1914 are taken into account in revising standard prices, then no immediate benefit will accrue to the stockholders from the improvements effected during all those years through higher efficiency in operation and development of business. It would therefore be very helpful if the Director could see his way to say whether or not the principle referred to is to be recognized in making amending Orders as to standard prices; inasmuch as if it is not, then there will be little use in preparing evidence on the matter, and taking up time in arguing it.

Changes in Parliamentary Gas Work.

THERE is only one Bill in Parliament this year dealing wholly with gas supply. Primarily, the fact is evidence of revolutionary changes in the method of securing new gas powers; for the tendency latterly has been to obtain additional authorization, through the Board of Trade, under section 10 of the Gas Regulation Act. When we have regard to the paucity, compared with a decade or so ago, of the applications to Parliament, or to the Board of Trade for Special Orders, for enlarged powers, and have in view the fact that the gas business of the industry has been making unprecedented strides the last five or six years, despite high prices for gas, the situation appears to be somewhat paradoxical. No doubt one reason for this is to be found in the fact that the manufacturing processes of the gas industry are to-day, and have been for some time past, productively more efficient than aforetimes. We see, for instance, from the adoption of new carbonizing systems, not only an increased production of therms per ton of coal, but a greatly enlarged yield from the same ground area and the same building. And this is generally supplemented by the product of water-gas or complete gasification plants. All this has an influence upon the expenditure on manufacturing plant per unit of business done. When with this are combined the advances that are being made in the physical qualities of the structural materials used in such plants (which affect beneficially their working lives), we submit that these are contributory reasons for the less frequent necessity for applications for additional statutory powers. But, of course, there are limits to this economy from higher efficiency; and the time will come for most gas undertakings when extensions or new works will be required. It is true that in other directions—gasholders, distributing plant, meters, and gas appliances—expenditure must have relation to the development on the old or higher lines; but, even in respect of gasholders, requirement is not on the standards of some years ago, seeing that the ability to produce gas quickly to meet sudden demands has had its reducing effect on the factor of storage capacity, though the engineer with ample storage and rapidly responsive producing plant regards himself as doubly blessed. It is, however, an interesting point that the large development of the industry's gas business has not seen any increase, but a falling-off, in the number of applications for extended powers compared with the days when Livesey, Woodall, Hunt, Newbigging, Stevenson, Valon, Phillips, and several others were prominent figures in the witness chairs in the Committee rooms at Westminster. Times have changed, and so has the parliamentary work in connection with the gas industry; and, industrially speaking, it has changed for the better.

Coke-Oven Gas and Differential Basic Prices.

AMONG the evolutionary advances of the gas industry during the past decade has been the economic one of utilizing, where advantage can be shown, part of the gas product of coke-oven plants situated at collieries. For some years now, the Rhymney and Aber Gas Company have been taking gas from the Bargoed coke-ovens of the Powell-Duffryn Steam-Coal Company, Ltd.; and so advantageous is this—on the one side to the Gas Company and their consumers, and on the other to the Coal Company—that the parties have entered into a new agreement for ten years from Jan. 1 of last year. The Rhymney and Aber Company are the promoters of the only wholly Gas Bill, to which reference is made in the opening lines of the preceding article. The measure to some extent is a novel one, because in it not only is parliamentary confirmation of the agreement asked for, but the Bill seeks to bring the Company on to the firm foundation of the therm, and, in conjunction with it, on to differential basic prices—lower ones when gas is not manufactured by the Gas Company, and higher ones when it is; for the Company have been careful to utilize the advantage they have gained not only to benefit the consumers, but in protectively maintaining their own works in fit condition for emergency operation. That they have been able to do this while benefiting the consumer in the matter of charge, and without finding any occasion during the war or since to seek a revision of their maximum price, speaks volumes. Considering these points, we feel sure that Parliament will readily subscribe to the submission of the Company in the preamble to the Bill that the utilization of the coke-oven gas is of public advantage as tending to conserve the mineral resources of the realm, as well as of local advantage.

After the several years' experience that the Company

have had as to their ability in regard to the retailing of coke-oven gas, compared with gas of their own manufacture, they must be accounted good judges of whether different basic prices are necessary under the two conditions. This is a novel, though in the circumstances an essential and very fair, proposal. Whether Parliament will deal with the point or refer it to the Board of Trade cannot at present be said. But anyway it means a new responsibility upon whoever has to consider the factors in the respective circumstances to arrive at a determination as to the justness of the figures. The Company ask that, within the urban district of Rhymney and the village of Pontlottyn, the basic price shall be 11·3d. per therm when they supply gas not manufactured by themselves, and 15d. when supplying gas which is manufactured by themselves; and within the remaining limits of supply, the suggested respective basic prices are 12·7d. and 16·4d. This recognition of a difference of 3·7d. per therm in favour of the coke-oven gas, shows that the Company are not anxious, through their favourable economic position in relation to coke-oven gas, to obtain undue benefit for their stockholders. There is a fairness about it which is a strong commendation. In the notice of the Bill in later columns, information is given as to how it is contemplated to deal with surplus profits, when the price charged is below the basic one. The proposals as to pressure are not in accord with the new standards; but in a district of such complex configuration, practical variations from the standards are, of course, necessary.

The agreement between the Coal Company and the Gas Company for the supply of coke-oven gas appears exceedingly fair to both parties. The only stipulations as to quality are that the gas is not to be less in calorific value than 425 B.Th.U., and there is to be in it no trace of sulphuretted hydrogen. The charge is to be 7·433d. per 1000 c.ft., which, calculated on the minimum calorific value, is about 1¾d. per therm. But while the accounts for the gas are to be paid by the Gas Company quarterly, at the end of each year there are to be adjustments if the price at pit of Rhymney Valley washed duff in any quarter has risen above 21s. per ton, or fallen below 14s. per ton. Then the variation in price is to be such as may be mutually agreed by the parties to be reasonable; failing agreement, there is to be arbitration. Both the Coal Company and the Gas Company are well protected. The former are to be under no obligation to supply more than 400 million c.ft. of gas a year—labour and plant conditions permitting. The Gas Company are to have priority of supply from the Bargoed ovens; but they are under an obligation not to purchase coke-oven gas from any other source, so long as the Coal Company can supply their requirements in accordance with the agreement. There is a provision for the Gas Company being indemnified against all forfeitures and penalties which may be imposed in consequence of the gas being below 425 B.Th.U., or containing a trace of sulphuretted hydrogen. But at any time the Coal Company may, after the expiration of six months' notice, reduce the calorific value of the gas to 400 B.Th.U., with an accompanying proportionate reduction of the charge. There are other conditions, the chief of which are noted elsewhere.

Good as is all this from an economic standpoint, the agreement recognizes the common weak spot in coke-oven gas supply for public purposes; but the Gas Company's experience of the value of obtaining such gas in bulk at a reasonable price is sufficient compensation for the risk. A clause relieves the Coal Company from all responsibility for any interruption, failure, stoppage, or suspension in or of the supply of gas occasioned by strikes, lock-outs, or disputes with, or abstention from duty by, workmen. The same applies to accidents or to other causes not within the control of the Coal Company. There are also protective conditions relating to the repair, alteration, renovation, or extension of the coke-oven plant. These things must be; but, the risks notwithstanding, there is an economic advantage in the Gas Company's area of supply in making use for public purposes of the first secondary product from the manufacture of metallurgical coke.

Cleansing Gas-Cookers.

THERE is a point in connection with the cleaning of gas-cookers to which we desire to call special attention. This work is of considerable importance to all gas undertakings. But it has always been a somewhat difficult problem; and there seems to be no specific cleansing method which is generally accepted as the best one. We should like to have this matter discussed in our columns, and experiences related, with the view of arriving at some decision from the reasons advanced as to which is the most suitable practice, having regard not only to economy, but to the maintenance of the soundness of certain vital working parts. In this regard, we wish particularly to submit and emphasize one consideration. During the last few years, owing to the changed conditions and the necessity for greater efficiency and economy, important improvements have been introduced into the brasswork fittings on gas-cookers and gas-fires. While the adjustments are strong, and will stand much wear and tear, they embody several smaller parts necessitated by the fine degree of adjustability given, as compared with the plain and solid surfaces in the ordinary brass tap, which hitherto naturally associated itself in the mind with gas-cookers. One of the cleansing methods employed by some gas undertakings is to dip the gas rail, with its brasswork undetached, into a cleansing bath containing a strong potash solution. Even for the old type of tap, this is a very undesirable method of cleansing; but with the newer types, it is subjecting a carefully designed and constructed piece of mechanism to altogether unfair conditions. In point of fact, gas-taps should never be put into a bath at all. There are plenty of well-known methods by which a tap which has become dirty may be cleansed and brought back again to its old polish. If the tap is working satisfactorily, and there is no leakage, the plug is best not removed; but if the tap is leaky and the plug wants re-grinding, then fresh lubricant should be applied. In view of the very important developments that are taking place—and others that we know will appear shortly—we feel that a timely warning should be given in this matter. And not only in connection with gas-cookers, but gas-fires; for we believe there are gas undertakings—they are no doubt very few in number—that subject the parts of fires to the same treatment.

The Purer Air Campaign.

SOME of the writers who take part in the purer air campaign cannot get beyond the idea that smokeless solid fuel from low-temperature carbonization is the only way of salvation; and the result is that those who are behind the scenes where practical work is done see some most fantastic notions in print for the supposed edification of the public, but which really result in their misleading. In "The Times" recently, Sir Maurice Abbot-Anderson appealed for purer air. We sympathize most sincerely with that appeal; but we cannot concede that the most practical way of achieving the objective is by fuel produced by low-temperature carbonization. That would, of course, eliminate the fouling of the atmosphere by smoke; but while we are about the work, let us prosecute it with a view to the use of a heating agent which will not only prevent pollution by smoke, but will save labour in the household. A writer of an article in the same contemporary, under the heading of "London Fogs: Trail of the Domestic Chimney," points out that, while the general employment of smokeless fuel would solve the problem, we have a long way to travel before we reach that millennium. Obviously he has lived long enough to know that the fogs of to-day, bad as they are sometimes, are not nearly so disgusting and nauseating as they were before gas cooking became a convention, and gas heating obviated the lighting-up of many fires—particularly those required for merely a short time. That the fogs are less severe, the writer owns is due in part to the remarkable increase in the use of gas and electricity for heating and cooking, and to the activities of the Coal Smoke Abatement Society and local authorities in connection with factory chimneys. We are afraid that in London electricity for cooking and heating has not done much towards the amelioration of the impurity of atmospheric conditions. But gas can lay claim to have made good contribution.

There are no statistics available as to the number of privately owned gas cookers, fires, &c., in London; but the number must be large. We have not the slightest doubt, however, that there are to-day approximately 1,250,000 gas-stoves on hire in the areas of the three London Gas Companies—at any rate, the number on hire in the Metropolis, at the end of December, 1922, was 1,174,375, while in the suburbs there were nearly half a million. These cookers and fires, which are used at a much greater efficiency than coal ranges and fires can boast, have displaced the use of a not inconsiderable amount of coal; and this work of dis-

placement goes on silently, through the recommendation of good service, and the co-operative and individual activities within the gas industry. At the same time, there is agreement with the writer in "The Times" that we are now at a stage when, without wider parliamentary powers, progress must be slow—that is to say, slow relatively to the work to be done; and the work is immense when it is remembered that, for domestic purposes alone, from 35 to 40 million tons of coal are still being used in Great Britain, and more than double that quantity for industrial purposes. Of course, the time is not ripe to make it obligatory on householders entirely to use smokeless fuel of any description. The writer in "The Times" is apparently not closely in touch with facts when he says the "well-to-do can look after themselves, using gas or electricity for heating and cooking." People must be very "well-to-do" to use electricity for heating and cooking; but as to gas, in the areas of the three London Gas Companies alone, at the end of 1922, there were no less than 795,012 prepayment consumers—most of them employing gas-cookers. For the greater part, these people are of the working class; and among them, the use of gas for cooking and intermittent heating is spreading. The Board of Trade returns for 1922 show that in Great Britain the statutory gas undertakings had connected up to their mains no less than 4,137,009 prepayment consumers, and 3,535,137 ordinary—together 7,672,146. A very large proportion of these consumers, both prepayment and ordinary, employ gas cookers and other heating appliances. We cannot therefore agree that, at any rate for cooking and the intermittent heating of rooms, the use of gas is a dream. The use is an actuality. And gas is getting very close to the cost of coal heating, when the relative times the fires have to be "kept-in," and all the subsidiary costs of coal fires, exclusive of the labour entailed, are taken into account.

However, the writer in "The Times" considers that the problem for science is to evolve a solid smokeless fuel which shall be economically advantageous to producer and user alike. But he sees a drawback even to that. "The atmosphere will be clear, but the products of combustion will be there just the same—invisible it is true, but potent to the eyes, nose, and mouth, whenever the atmospheric conditions are favourable." There is more truth in this than there is concerning the products of combustion of gas. The purification processes to which gas is subjected makes of it a fuel of great refinement; and the products of combustion do no harm to the atmosphere. If the writer in our morning contemporary will only think of all that is removed in the processes of carbonization and purification that is in in raw coal, and which, as crudely used in our fireplaces, emits an abundance of noxious effluvia, he will vote gas as the superfine heating agent. In a negative way, however, he indicates that gas does foul the air, when he says: "It must be obvious to any thinking person that, of all heating agencies now available in cities, electricity is the only one that does not foul the air." It would have been of popular interest if he had stated how and to what extent gas fouls the illimitable atmosphere in comparison with electricity. But apparently he is aware that economically electricity has little chance of making substantial headway for heating. Probably he knows that the B.Th.U. expended in producing electrically 3420 B.Th.U. are anything between (say) 25,000 in the best power station work and (say) 75,000 in some of the poorer and inefficient central stations. The difference between the product and the expenditure in the case of even the best stations is sufficient to prove the truth of the words in the article that "electrical engineers have a long way to go before any but wealthy persons can contemplate the use of electricity for the many domestic purposes for which coal or gas is now used."

One other point. The writer says that the reformer's prime difficulty is to clear the air without touching the pockets of the masses whose chimneys are at the root of the evil. Perhaps more could be done in achieving the purification of the air by proceeding along a different line, and attracting people by something which more directly affects them. Why is it that gas has accomplished as much as it has done, and has so luxuriantly added to the volume of the heating business of the industry during these latter years of high gas prices? The answer is that it has been largely due to the fact that gas is labour-saving, cleanly, and handy. It has not been due to the claims and attractions of air sanitation. The hint should be taken by the would-be reformers. The road for them to travel is the one which will gain the objective at the fastest rate.

The Gas Exhibit Fund.

We learn that the appeal for funds for the Gas Exhibit at the British Empire Exhibition is "going well." But in a case of this kind, it is always the last third or quarter of the total sum required that is the most difficult to get. Those who are voluntarily carrying out this work for the industry are delighted with their success so far; it remains for those gas undertakings and firms who have not yet sent in their contributions or promises, to crown the efforts that are being made by a prompt response to the appeal. This is a piece of co-operative work for the industry of the first magnitude.

Railway Companies again on the War Path.

The railway companies have found a fresh subject upon which to attack gas undertakings applying for new powers. Some time ago it was inerts; then pressure in relation to calorific power; and now it is a question of capacity of mains. For several sessions past, it has been customary in Gas Bills to insert a clause relieving gas undertakings of the obligation to give from any main a supply of gas for any purpose other than lighting or domestic use in any case where the capacity of the main is, at the date when the notice is served, insufficient for the purpose, or if, and so long as, the supply would interfere with the sufficiency of the gas required to be supplied by that main for lighting and domestic purposes. The object of the clause is, of course, to protect existing consumers of gas supplied from any particular main, and to relieve the gas undertaking from the necessity of at once incurring a large additional expenditure on main enlargement for a supply which would not alone justify the outlay. The railway companies are opposing any Special Order which contains the clause. They are late in the day in doing this, seeing that there is good precedent for it. The Director of Gas Administration considered it was a matter in which discussion between the railway companies' representatives and the National Gas Council might result in the discovery of amending words which would be satisfactory to both parties. The railway companies, however, are obdurate. Nothing will satisfy them except the complete abandonment of the clause. Their contention is that there is an obligation upon gas undertakings to supply gas in any quantities that may be required by a consumer, whether domestic or industrial; and therefore, if a main is not large enough, then it is the duty of the gas undertaking to lay one of greater capacity. The position at the moment is that the railway companies are considering a suggestion that the clause should be redrafted, so as to ensure continuity of supply to existing domestic and industrial consumers, and for it to apply only to applications from new industrial consumers. We cannot see that the railway companies have any ground for interfering in this matter, so long as they are themselves assured of a continuity of supply. Gas undertakings are not likely to do anything that is inimical to their own business.

Alterations to Highways and Gas-Mains.

There will in all probability be a heavy challenge to the proposal of the London County Council that main and cable alterations necessitated by the diversion of highways should be borne by the owners of the pipes and cables. Steps are being taken to ascertain whether joint action against this shall be instituted by the National Gas Council and organizations representing the electrical and water interests. Whether or not anything is done jointly, the National Gas Council will contest the proposal, for which the County Council are trying to secure the support of all highway authorities.

Miners and Political Action.

The Miners' Federation are beginning to feel new strength in connection with their claim for a revision of the national wages agreement, with the view of increasing the minimum wage of the miners, and giving them a larger share in surplus profits. When the result of the ballot is known on the subject of the three months' notice to terminate the agreement, negotiations will be resumed with the representatives of the owners. The men's advocates contend that a uniform advance in the minimum wage in all the districts would not disturb the economic balance between the trade of those districts, and that the coalowners could then pass on the increase to the consumer by a corresponding rise in

the price of coal. That is exceedingly amiable of the miners, with domestic consumers in London paying (say) 47s. to 52s. per ton for household coal, and industry some 100 p.ct. more at the pithead than before the war. Now the Miners' Federation are proposing to operate in a second direction. The political outlook has been changed by the General Election. Of 192 Labour members in the House, 47 are representatives of mining constituencies; and their candidatures were endorsed by the Federation. This means that nearly one-fourth of the Labour members represent the miners; so that their position as a controlling influence cannot be gainsaid. The whole of the Labour members are pledged to nationalization of the mining industry. But the first thing will be to secure an increase in the minimum wage. Failing the obtaining of concessions from the owners, it is probable that an attempt shall be made to pass the Coal Mines Minimum Wage Act, 1912, Amending Bill. The 1912 Act gives a certain minimum subsistence wage to those men who fail to earn it under their tonnage contract; while the Amending Bill proposes to extend the scope by giving a fixed minimum wage to all workers in and about the mines, based on the cost of living. Anyway, the Labour members, who profess to have the interests of the country at heart, intend that the consumers shall pay for anything additional that they can secure for the miners. The consumers of both coal and gas include millions of working people.

Responsibility for the Price of Coal.

Who is responsible for the present high price of coal? The colliery owners charge the merchants; and the merchants return the compliment, stating that the coalowners raised the pithead price of coal to them twice during last month. The colliery owners say they are only receiving the same price as in November; but that is not generally true, as the invoices of coal factors disclose. Others again assert that it is the fault of the railways, whose amalgamations have led to serious delays in the delivery of wagons. The railway companies, in turn, deny this. In short, there is denial all round; nobody will own up to responsibility. When in a tight corner, the aid of the law of supply and demand is sought as an excuse; and this is so on the present occasion. The railway companies are quite indignant regarding the allegations against them as being participators in causing the rise. They point out, for example, that on the L. & N. E. Railway system alone, coal and coke to the total of 86,300,000 tons were carried in 1923, against 84,600,000 tons in 1913, and 75,650,000 tons in 1922. However, the retail prices for coal show no present symptoms of receding; and the public have to pay the prices demanded, which one firm of coal factors declares cannot be justified.

Co-operation and Pollution.

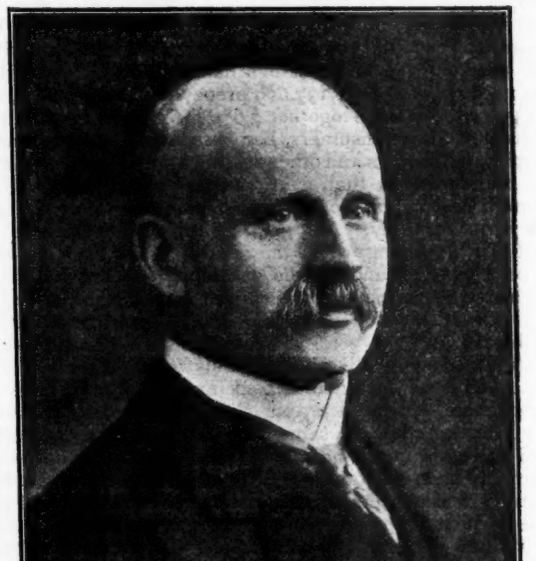
The Standing Committee appointed in 1921 to consider the problem of river pollution, particularly as it affects fisheries, have presented a report to the Minister of Agriculture. The gas industry is concerned in this, as gas undertakings have somewhat frequently been charged with contributing to the contamination of rivers, or have been under suspicion of doing so. The energies of the Committee, it appears, have been directed to the safeguarding of the purity of streams that are unpolluted, while constantly endeavouring to raise the standard of all polluted rivers. They are hoping that their investigations will lead to conclusions which will enable the devising of practical measures to abate pollution. Past legislation has been ineffective. Drastic legislative methods could not at the present time be put into operation, owing to the enormous financial charge which would have to be incurred by local authorities and industry, if forced to purify their effluents before discharge into rivers and streams. Consequently, the Committee are seeking to improve the condition of rivers by a steady attempt to limit all noxious effluents by representations to the local authorities where the discharge of sewage is killing fish, and by discussing with manufacturers the introduction of methods of treatment to improve the quality of their effluents at an economic cost. The Committee know that a great deal of river pollution is due more to lack of knowledge of effective economic treatment for waste products, and perhaps to lack of appreciation of the damage thus caused, than to callous negligence; consequently, their policy is one of conciliatory co-operation, as opposed to litigation.

OBITUARY.

ARCHIBALD P. MAIN.

It is with sincere regret that we record the death, at Vale Court, W., on the 1st inst., after a few weeks' illness, and at the age of 66 years, of Mr. Archibald Pollock Main. He will be greatly missed by many in the gas industry, to whom his kindly disposition had much endeared him. He possessed literary gifts of no mean order, and his speeches always manifested considerable depth of thought. In this connection, special reference may perhaps be made to his address at the time he was an extremely popular Chairman of the Council of the Society of British Gas Industries.

Mr. Main was associated with his brother, the late Mr. Robert B. Main, with the firm of Messrs. R. & A. Main, gas cooking and heating apparatus manufacturers, of Glasgow. In 1897 the firm, after being incorporated as a limited liability company, amalgamated with the old-established firm of Messrs. Thomas Glover & Co., gas-meter manufacturers and engineers, London. In that year Mr. Main was appointed a Director of the three allied Companies—R. & A. Main, Ltd., Thomas Glover & Co., Ltd., and Glover and Main, Ltd. In 1904 he was appointed a Managing Director of R. & A. Main, Ltd., and on relinquishing this appointment in 1913 was appointed Vice-Chairman of the three Companies—a post which he held until the time of his death. In July, 1918, Glover and Main (Birmingham), Ltd., was formed, and Mr. Main became a Director of this Company also.



ARCHIBALD POLLOCK MAIN.

Our deceased friend was a prominent figure in the gas industry, and did much to improve the manufacture of, and develop the use of, cooking and heating apparatus. He was an active member of the Society of British Gas Industries, and was Chairman of the Council 1918-19. Mr. Main took keen interest in the work of the Food and Cookery Association and of the Coal Smoke Abatement Society. He was a member of the St. Marylebone Borough Council (No. 9 Cavendish Ward) from 1919 until his death, and a Past Master of the Evening Star Lodge. Mr. Main devoted much of his time to, and interested himself in many ways in, social work for the betterment of the poorer classes. In 1921 he undertook a world tour in the interests of the Glover and Main Companies, visiting Ceylon, Australia, New Zealand, Canada, and the United States.

He leaves a widow—with whom much sympathy will be felt—but no children.

PERSONAL.

An interesting ceremony took place on the 31st ult. in the offices of the Leeds Branch of Messrs. James Milne & Son, Ltd., on the occasion of the retirement from active management of Mr. W. D. HELPS. In the presence of the staff and workmen, a handsome silver mounted mahogany smoker's companion was

handed to Mr. Helps, as a mark of the esteem and affection in which he is deservedly held by the employees.

For the position of Gas Engineer and Manager to the Burnley Corporation, rendered vacant by the resignation of Mr. J. P. Leather, there were forty applicants. The Gas Committe have prepared a short list of eight candidates for further consideration.

Last Thursday, the Burnley Town Council conferred the freedom of the borough for distinguished services on Alderman HARTLEY EMMOTT, J.P., who has served on the Gas Committee for 28 years, and been Chairman since 1898. The resolution placing on record his services to the town states: "The uniformly successful working of the gas undertaking is in no small measure due to Alderman Emmott's unremitting care."

The Neepsend station of the Sheffield Gas Company was the scene of a pleasant gathering during the week-end, on the occasion of a presentation of a silver tea and coffee service to the Assistant Manager, Mr. H. B. HOLLIDAY, who is leaving to take up the appointment of Chief Assistant Engineer of the Gas and Water Department of the Wallasey Corporation.

Gratification which has been aroused in Nottingham regarding the honour of knighthood which was recently conferred upon the Chairman of the Corporation Gas Committee, in recognition of his valuable services to the Municipality in general, and particularly in connection with the City's chief trading undertaking, found expression at the last meeting of the Council, when Sir ALBERT BALL occupied his seat upon the aldermanic bench for the first time since the dignity was bestowed upon him. The Mayor (Alderman J. Houston) tendered the hearty congratulations of the members to the new knight, observing that the honour had been well earned. For nearly a quarter-of-a-century, Sir Albert had placed at the disposal of the city his great business ability. Sir Albert Ball said he felt that the honour which had been conferred upon him was the more valuable when it was approved by those among whom he had worked so long.

ELECTRICITY SUPPLY MEMORANDA.

THE pro-electricity and anti-gas attitude of the Labour Party is a perfect riddle. In the political programme of the party, they include electricity for nationalization; and in their pamphlets they accept as gospel the fiction contained in the reports of the Departmental Electricity Supply Committees who took part in the reconstruction fiasco of a few years ago. Electricity was then to be generated and distributed with so much economy and efficiency that even Hodge in his remote country village would be able to secure supplies of current at a price which would enable him to use it for lighting, cooking, and heating. That time is no nearer to-day than it was four or five years ago "Meteor" of the "Electrical Times" has marked the nationalization ambitions of the Labour Party, and their belief that the time is coming when electrical energy will be available for all domestic purposes in every working man's household. We do not envy the electricity industry the attentions of labour in respect of nationalization. The electricity industry itself does not relish it. "Meteor," however, is convinced that there is little doubt that a Labour Government would earmark electricity supply for early treatment. Yet we think our friend is secretly a little bit elated that the labour leaders see so much good in the industry that they desire to nationalize it, and does not name the gas industry for the same honour. The gas industry is quite satisfied. The nationalization of the electricity supply industry would be an advantage to the competing industry, as bureaucratic management and control never was, nor will be, of any benefit to manufacturing or trading undertakings. "Meteor" makes good use of the brand of sarcasm which he keeps for special occasions. He heartily pulls the leg of labour when he says that "every consideration which renders electricity a desirable subject for expropriation applies to gas, with a single exception—gas is moribund." Our friend, we believe, knows differently; if, however, his information is defective, he had better study the last issues of the returns relating to statutory gas undertakings. He will there see that those undertakings at the end of 1922 possessed 7,672,146 consumers; and the Labour Party should note that of that number no less than 4,137,009 were prepayment ones. It will also be of interest to observe that during 1922 the sales of gas by the "moribund" industry increased by no less than 3,525,677,000 c.ft. Is this "Meteor's" idea of decay, and of the gas industry being a "predestined corpse?" This is what he says: "The Labour Party has a nice nose for indications of decay; and it has no desire to saddle itself with a predestined corpse." That may be funny; but the facts of the matter declare it to be sheer nonsense.

Labour and Nationalization.

The Misleaders.

As previously said, the attitude of labour towards electricity is a riddle. The gas industry gives more employment to labour in the production of gas than the electricity industry does in the generation of current; and it to-day supplies with gas something like 4¼ million people through prepayment meters. Nevertheless, the Labour Party (as we saw on Nov. 21, p. 502) are issuing pamphlets advocating the extended use among the working class of electricity, and promising all sorts of picturesque results for the hard-worked housewife, whose duties to-day are so much eased by the labour-saving facilities offered by gas. Electricity can do very little that gas cannot do; and gas can light, heat, and cook far more economically. Just imagine the 4¼ million households with prepayment gas-meters paying the price for heat supplied electrically. Only people with deep purses can afford it, and then they soon tire of the indifferent service. But not all prominent labour leaders believe in the hyperbole contained in the pro-electricity and anti-gas pamphlets issued by the Labour Party. One of them recently wrote: "As you know, in spite of all the developments that have taken place with regard to electricity in different parts of the country, I don't think the gas industry has suffered very much, and never will in my humble judgment." That labour leader has knowledge that is not possessed by the writer of one labour pamphlet which literally coruscated with fiction respecting the capabilities of electricity in the working man's household, but the uneconomy was kept out of sight. However, the electrical "policy" of the Labour Party does not square with the patronage preference of the people. The people prefer to buy in the market which yields them the most value for their money.

Prohibition Hours.

Even where it is more than ordinarily propitious to have a cooking load for an electricity station, it is found necessary to have what are called hours of embargo when electrical energy may not be used for that purpose. An interesting translation of an article which emphasizes this has appeared in the "Electrician." It was written by Mr. Charles Hässler, and is based on experience in Djursholm, in the neighbourhood of Stockholm. The residences there are of a superior type; the occupants well-to-do; and there is no gas supply in the area. It is only natural therefore that the residents should do the best they can for cooking with the electricity service. The first interesting item in the article is that the mean yearly consumption for interior lighting is 190 KW.-hours for each service. The cooking consumption averages 1750 KW.-hours per service point per year—*i.e.*, nearly ten times the lighting load. The cooking consumption per person varies with the number of persons supplied from one service; but a mean value is 323 KW.-hours per person per year—*i.e.*, about 0·9 KW.-hour per person per day. The cooking consumption during the hours of embargo is about 20 p.ct. of the total. Of more importance than the energy consumption are the relative peak loads due to cooking and lighting respectively. The load can be measured at Djursholm, and be subdivided approximately to give the cooking and lighting consumptions. A chart shows such a subdivision for a normal day in September, 1920. The cooking load is seen to be very high, and has three distinct peaks—in the morning (7 to 8 a.m.), at noon, and at 5 p.m. A curve for total consumption shows the great importance of the cooking load on the output of the station. From observations it was found that with the double tariff the maximum cooking load per point in the time between 3 p.m. and 10 p.m. in the winter months was 0·44 KW., and the yearly consumption per point was about 1750 KW., corresponding to about 4000 hours' use; further, that lighting furnished a yearly consumption of 190 KW., corresponding to about 1250 hours' use. The author says that the cooking consumption loads up the distribution lines and feeders, so that for supply systems which are already fully loaded for lighting, and for which the cost of enlarging cables is prohibitive, it will be necessary to institute some means whereby the cooking load can be much reduced at the times of peak load, in order to keep these peaks within limits. By thus distributing the output more uniformly over the day, the cables can take the extra load during otherwise slack times. Of 1000 consumers on the Djursholm system, about 225 have all electric cooking arrangements. Curves and examples indicate that the most desirable number of consumers taking cooking loads is in the present case about one-third of the total. With this number the cooking and lighting peaks would be as nearly as possible equalized. In connection with domestic consumption other than for lighting, there is a limiting point at which advantage for the undertaking begins to depreciate.

Street Lighting and Modern Changes.

Modern changes in the habits of people and in the conveniences of locomotion have made the lighting of the streets a far more important matter than was the case a comparatively few years ago. Particularly is this so in London and in the large provincial cities and towns. Motor-cars and taxi-cabs dash along roads, and pass at fairly high speeds from side streets into main thoroughfares, and *vice versa*. And there are many such vehicles. People, too, more than ever to-day seek their pleasure in places of public entertainment; and the managements of hotels and restaurants report that the habit of taking evening meals away from home is a growing one. Thus there are more pedestrians about the streets at night. Hence the need for sufficient—not extravagant—lighting; also for lights that are qualitatively good—free from glare, and giving a fairly uniform illumination. But we are afraid that with not a few lighting authorities money and not need is chiefly considered in making plans for street lighting; and due to this indifferent lighting is often seen. Though one can only look upon it as a peculiar idiosyn-

crasy of local authorities owning electricity undertakings, often the question of money is the last thing that troubles their minds, if advantage, however dearly bought, is to be gained for the electricity concern. The ratepayers are a secondary consideration. Some local authorities in this matter behave as though they were elected primarily to look after the interests of the electricity concern, and not of the ratepayers. It is a pity, but it is the truth. Progress in street lighting is hindered not more by money considerations than by municipal trading interests. Beyond the fresh street-lighting needs brought about by the modern changes in traffic and convention, there is the question of the relation of lighting to crime. Bad lighting facilitates it; good lighting is an obstacle to it. This has been recognized time and again. In good lighting there is safety; besides which, in shopping areas, the commercial interests of the locality are served. These points were brought out in an article on "Street Lighting and Public Safety," by Mr. W. Millner, B.Sc., of the Lighting Service Department of the British Thomson-Houston Company, Ltd., which has appeared in the "Electrical Times." There is nothing new in them; but they are points which require to be accentuated, as, although they are truths which should have weight in framing street-lighting policy, they are all too frequently ignored by local authorities.

Flat-Rate Disadvantages.

The two-part tariff is making greater and greater headway in adoption by electricity undertakings, although frequently there is no relationship between the supply and the basis on which the fixed charge is assessed. But it is regarded as a means to an end, in that it does away with duplicate wiring and meters, and so diminishes the cost of installation where the current is used for purposes other than lighting. The Preston Town Council, on the recommendation of the Electricity Committee, are going to adopt the system as from April 1. The "service" charge will vary with the size of the house; and a charge of 1d. per unit will be made for all current consumed, less 10 p.ct. discount. The service charge is to be based on the rateable value; the minimum being £6 on houses rated at approximately £30. The "Electrician," in a comment on flat-rate disadvantages, expresses the hope that the standardization of tariffs will be towards the wider use of two-rate methods. It submits that, paradoxical as it may seem, the very simplicity of the tariffs charged by certain electricity supply undertakings is an obstacle to the greater use of domestic equipment. The disadvantage in respect of flat-rate charging of dual wiring and meters is mentioned; "the greatest disadvantage is that it prevents the proper development of that greatest of electrical advantages—flexibility." Our contemporary quotes these examples: "When a two-rate tariff is used, it is possible to employ in a bedroom a power plug and a lighting plug on the same circuit. With two separate tariffs this is impossible without two separate circuits. It is often convenient to supply an iron from a lighting point through an adaptor. This cannot be done with two separate tariffs, unless the supply is given at a lighting rate." Then the hope that, for the sake of progress, there will be not only a greater standardization of tariffs, but that this standardization will be towards the wider use of two-rate methods. Probably it will be; but the system, as generally practised at present, is radically unsound. This is recognized by many electrical engineers; but they take refuge in expediency.

Wide Tendering.

The London County Council recently invited tenders for a 15,000 KW. steam turbo-alternator, condensing plant, &c., for the Greenwich power station. There was some wide tendering; and the lowest offers were from three Swiss manufacturing firms, with offices in this country. The lowest of these tenders was for the turbo-alternator £42,964, and for the condensing plant £12,805. The lowest offer from a British firm was £57,740 tor the turbo-alternator, and £12,364 for the condensing plant; the highest £62,607 for the former, and £11,161 for the latter. The difference between the last named and the lowest Swiss tender was £18,000. There were also separate tenders for the condensing plant—the highest being £13,190. For wiring, electrical accessories, lighting appliances, and glass, there are the same differences—prices of the foreign manufactures are all less than those of British make. Take, for example, wire, with a wholesale British price per ton of £28—the German price for the same material is £21 10s. Porcelain insulators which cost here 6½d. each, are obtainable from Germany at 3½d. Electric lamp globes of British make costing 18s. per doz. can be obtained from Czecho-Slovakia for 9s. 3d.; British production costing 30s. per doz. can be obtained from that country for 20s. 3d. The same thing applies to most other electrical articles.

Reading a Gas-Meter from Outside.—The "American Gas Journal" for Dec. 15 contained a couple of photographs showing how the gas-meter box has been built into the wall of a house in Oakland, so as to permit the gas company's employees to read the meter from the outside, by simply raising a wooden flap. This renders it unnecessary for the employees to enter the house, and they will not have to make a second call in the event of no one being at home to admit them. At the same time, of course, it relieves the housewife of the interruption caused by having to admit the meter reader.

INSTITUTION OF CIVIL ENGINEERS.

A Record of Origin and Progress.

IT was with a feeling of much gratification that we were enabled in last week's "JOURNAL" to make announcement of the fact that, following upon the recent grant of a third Supplemental Royal Charter to the Institution of Civil Engineers, members and associate members now "are, and are entitled to describe themselves as, Chartered Civil Engineers." This interesting stage draws attention to the long history of an important and greatly esteemed Institution, in commemoration of the founding of which, on Jan. 2, 1818, a valuable record of origin and progress was prepared by the Secretary (now Hon. Secretary), Dr. J. H. T. Tudsbery, M.Inst.C.E., and presented to the Institution at their centenary, six years ago, when Mr. Harry E. Jones, as President, occupied the chair.

The Institution was founded at a meeting held at the Kendal Coffee House, in Fleet Street, by a small group of young civilian engineers, who, in adopting the title of the Society, distinguished themselves from military engineers. On March 21, 1820, Mr. Thomas Telford accepted an invitation to become the first President, and under his leadership the Institution grew steadily in importance, until, in 1828, a Royal Charter of Incorporation was granted, for the general advancement of mechanical science, and for promoting the acquisition of the kind of knowledge which constitutes the profession of a civil engineer—this profession being defined by the Charter in general terms as "the art of directing the great sources of power in Nature for the use and convenience of man, as the means of production and of traffic in states, both for external and internal trade."

In 1828, when the Charter was granted, there were 156 members; in 1836, at the time of the first publication of the "Transactions," the number was 238; and by 1914, it had become 9266. The grades of membership have been varied slightly on several occasions. Mr. Charles Manby became Secretary in 1839, Mr. James Forrest occupied the position from 1860 until 1896, then followed Dr. Tudsbery, and the present Secretary is Dr. H. H. Jeffcott, B.A.I. The publications of the Institution to date comprise 216 volumes of "Proceedings," as well as various lectures and special prints. At the present time the publications consist of "Minutes of Proceedings," "Selected Engineering Papers," "Engineering Abstracts," and "Sessional Notices."

QUALIFICATIONS FOR MEMBERSHIP.

The education and training of engineers has been the subject of numerous inquiries by the Institution from time to time, and the qualifications demanded by them for admission have been adjusted in accordance with the results of these investigations, with the gradual extension of facilities for scientific training, and with the ever-widening field of engineering work; and always with the object of raising the standard of qualifications for Corporate Membership. The requirements for the Institution diploma, while sufficiently elastic to allow for the particularities of methods of training in vogue, necessitate a minimum of five years' preparation and training (including both engineering works and drawing office experience), and in addition the passing of appropriate examinations, or the possession of recognized university degrees in engineering science, as well as satisfactory general education, as an essential preliminary to such studies and training.

DESCRIPTION OF MEMBERSHIP.

Thus, while the unregulated and unrestricted use of the appellation "Civil Engineer" has deprived it of all weight and significance in the matter of professional qualifications, the designation of Corporate Membership of the Institution ("M.Inst.C.E.," or "Assoc.M.Inst.C.E.") has come to be recognized as an authoritative mark of professional competence and standing. Nevertheless, the mere designation of membership of a society has been found in recent years scarcely to carry with it that definite idea of status to which the public is accustomed in dealing with professional men; hence the adoption of the term now authorized to the members of the Institution—"Chartered Civil Engineer."

To Assure Success.—Mr. A. L. Tossell, of the People's Gas Light and Coke Company, Chicago, was Chairman of the Relations with Customers Committee, who, in a report to the American Gas Association, pointed out that every employee should feel and realize his importance, and should be representative of all that the company stand for, so far as the customers are concerned. Mistakes will happen in all departments, and the effect of such errors on the customers must be eradicated, and their goodwill maintained. This is the important work of any utility undertaking, and by its success the company's prosperity and standing are measured. A personal call on a dissatisfied customer by a representative of the management has an important and desirable effect. The customer is impressed with the friendly attitude of the representative who is ready to explain everything intelligently, and shows a willingness to make any reasonable concession, or comply with any request, not as an evidence of weakness, but in a spirit of fairness, with a desire to be of real service to the customer.

GAS BILLS FOR 1924.

A Welsh Coke-Oven Gas Agreement.

IT may be anticipated that the new parliamentary session, so far as gas is concerned, will be painfully thin. The reason is that promoters are taking advantage of the method of obtaining additional powers by means of Special Orders through the Board of Trade. Notices have been issued for four Bills only. Three of these are Corporation promotions, and only incidentally deal with gas. There is one Company Bill. In these, there is not much that will prove of a controversial nature.

The CROYDON CORPORATION have introduced a Bill in which, *inter alia*, they are proposing to make certain adjustments in their boundaries. An agreement has been effected between them and the Mitcham District Council providing for the removal of inconvenient parts in their respective boundary lines, which will necessitate the transfer of certain small areas of land from the borough to the urban district, and from the urban district to the borough. It is proposed that the area added to the borough shall be incorporated in the district of supply of the Croydon Gas Company, and excluded from that of the Wandsworth, Wimbledon, and Epsom District Gas Company; while the area transferred to the District Council shall be included in the Wandsworth Company's supply district, and excluded from that of the Croydon Company. Whether these Companies are favourable to this is not indicated in the measure. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

The Bill of the MANCHESTER CORPORATION makes provision for a couple of changes in their gas-supply area. In the first place, it is proposed that the parish of Timperley in the rural district of Bucklow, in the county of Chester, shall be excluded from the area within which the Corporation are authorized to supply gas; and the words "and the township of Timperley in the rural district of Bucklow" in section 4 of the Manchester Corporation (General Powers) Act, 1921, are to be repealed. The area within which the Corporation are authorized to supply gas it is intended to extend so as to include the parishes of Carrington and Partington in the rural district of Bucklow in the county of Chester. The Acts relating to the Corporation gas undertaking and the supply of gas by them are to have effect as if these parishes had originally been included therein. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

The RHYMNEY AND ABER GAS COMPANY are applying to Parliament for various new powers. The preamble of the Bill states that the Company have an issued share capital of £173,140, entitled to a maximum dividend of 10 p.ct. per annum, and £3828 preference shares, bearing interest at the rate of 5 p.ct. They have created and issued debenture stock to the amount of £57,115. The maximum price authorized to be charged for gas within the urban district of Rhymney and the village of Pontlottyn is 4s. per 1000 c.ft.; within the urban district of Caerphilly and the parishes of Van and Gelligaer (excluding Pontlottyn) 4s. 6d.; and within the remainder of the limits of supply 5s. 6d. The Company are now desirous of transferring to the heat-unit basis of charge. The works at Caerphilly and elsewhere are sufficient to supply the demands for gas; but for some years the Company have been obtaining from the Powell Duffryn Steam Coal Company, Ltd., a supply of gas in bulk from the coke-ovens at the Bargoed Colliery. It is remarked that "the utilization of the gas is of public advantage, as tending to conserve the mineral resources of the realm, and of local advantage in that the Company have been thereby enabled to supply gas within their limits of supply, both during and since the war, without making application for power to increase the maximum prices for gas fixed by the former Acts." It is therefore submitted that it is expedient that an agreement between the Powell Duffryn Company and the promoting Company should be confirmed.

The agreement is set forth as a schedule to the Bill. From it we learn that the supply of coke-oven gas is to be delivered into one of the Company's holders; and a meter is to be provided for registering the gas. The agreement is to remain in force for a term of ten years from Jan. 1, 1923. The gas may be taken in such quantities and at such times as may be required; but the Coal Company are to be under no obligation to supply a greater aggregate quantity than 400 million c.ft. a year. But the Gas Company are not to purchase gas from other coke-oven sources, so long as the Coal Company are able and willing to supply their requirements. The price to be paid for the supply is to be 7·433d. per 1000 c.ft. At the end of each year, an inquiry is to be made by the Coal Company, and if the average price at pit of Rhymney Valley washed duff for any quarter shall have risen above 21s. per ton, or fallen below 14s. per ton, then the price to be paid for the gas supplied under the agreement in such quarter shall be increased or decreased, as the case may be. The variation in price is to be such as shall be agreed by the parties as reasonable in the circumstances, and commensurate with the increased or decreased cost of production; and in the event of failure to agree, the figure is to be determined by the President of the Institution of Gas Engineers, or some person nominated by him. The Coal Company are not to guarantee the quality of the gas in any way, but the calorific value is not, during a period of two hours on any day, to be less than 425 B.Th.U.; and it is not to contain any trace of sulphuretted hydrogen. But the Coal Company may at any time, upon the expiration of six months' notice, reduce the calorific value to not less than 400 B.Th.U.; and upon this taking effect, the price of the gas is to be reduced in proportion to the number of B.Th.U. by which the calorific value is lowered. The Coal Company are not to be responsible for any interruption, failure, stoppage, or suspension in or of the supply of the gas occasioned by strikes, lock-outs, or any disputes with workmen, accident to plant, or other unavoidable cause. Further, the Coal Company are to be entitled to discontinue the supply for the purpose of effecting repairs, alterations, renovations, or extensions to their plant and works; but, before so doing, they are to give to the Gas Company seven days' notice in the case of repairs and alterations not the result of accident or breakdown, and in the case of renovations or extensions reasonable and sufficient notice to enable the Company to make other arrangements should it be likely to interfere with the supply by the Coal Company, who are to execute the work with all possible speed and dispatch. The Gas Company are to have priority of supply from the Bargoed coke-ovens; and in the event of any complaint by them as to the quality of the gas, the Coal Company are to take immediate steps to rectify the matter. Should the use of the gas be at any time prohibited by law, or if the gas supplied by the Coal Company is of such a quality that the Gas Company are unable to satisfy the legal requirements of their consumers, it will be lawful for the latter to determine the contract upon giving to the Coal Company three months' notice. Provision is made for the settlement of disputes by arbitration.

Turning to the clauses of the Bill, a scheme for the consolidation of the ordinary shares is set forth. It is proposed to consolidate them into £154,000 of ordinary stock, which is to be divided at the rate of £5 10s. for each ordinary share held. The therm system is adopted. In regard to pressure, it is proposed that the pressure in any main or in any pipe laid between the main and the meter, having an internal diameter of 2 in. or upwards, shall be such as to balance a column of water not less than: (*a*) In the case of gas supplied to any premises situate at a lower level than 300 ft. above Ordnance datum, 1½ in. in height, and (*b*) in the case of gas supplied to any premises situated at any higher level, 2 in. in height. These provisions are not to apply to power gas, or any separate supply for industrial purposes only. The prescriptions as to testing will be in the hands of the Gas Referees; but it is proposed that, except as provided by the measure, sections 1 to 9 of the Gas Regulation Act shall not apply. The provisions as to a basic price are novel, in that they arrange for a different one when the gas is not manufactured by the Company and when the gas is manufactured by them. In the former case, within the urban district of Rhymney and the village of Pontlottyn, the basic price named is 11·3d. per therm; in the latter case, 15d. Within the remainder of the limits of supply, the proposed basic prices are respectively 12·7d. and 16·4d. The basic rate of dividend proposed is 7 p.ct. As to the division of surplus profits,

> If and so far as the balance standing to the credit of the net revenue account for any year (after providing for dividend on the preference capital of the Company and at the basic rate on the ordinary capital of the Company) in the opinion of the Directors permits, there shall be applied: (1) For the benefit of the holders of the ordinary capital of the Company a sum not exceeding one-sixth of the amount by which the total amount actually payable by consumers for gas supplied to them in that year is less than the amount which would have been so payable if the gas had been charged for at the basic price; and (2) for the benefit of the employee co-partners of the Company an amount not exceeding a sum calculated at the rate of 3 p.ct. of the aggregate salaries and wages (including war bonus, but excluding overtime) in that year of the said employee co-partners for each 1 p.ct. by which the rate of dividend paid in respect of that year on the ordinary capital of the Company exceeds the rate of 6 p.ct.

Provision is made for the revision of the basic price; and powers are taken in respect of special purposes and reserve funds. As to prepayment meter charges, the maximum for the hire of a meter and fittings and one without fittings, it is suggested, shall be at the rate of 2·82d. and 1·41d. respectively per therm, or in either case 10 p.ct. on the cost of the meter and fittings (if any), whichever shall be the higher. The maximum price to be charged for gas for public lighting in any urban or rural district is in no case to be higher than 10 p.ct. below the charge to ordinary consumers within such district. Clauses to give power to establish profit-sharing are incorporated in the Bill, as well as a clause confirming the agreement with the Powell Duffryn Coal Company. Provisions appear empowering the bulk purchase and supply of gas. [*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

The Omnibus Bill of the ROTHERHAM CORPORATION contains three clauses relating to the supply of gas; but they are now quite ordinary in character. The first enacts that the Corporation shall not be obliged to give from any main a supply of gas for any purpose other than lighting or domestic use in any case where the capacity of the main is, at the date when notice is served upon the Corporation requiring the supply to be given, insufficient for such purpose, or if and so long as any such supply would, in the opinion of the Corporation, interfere with the sufficiency of the gas required to be supplied by means of that main for lighting or domestic purposes. Further powers are sought regarding the entering of premises. It is proposed to extend section 22 of the Gas-Works Clauses Act to all cases in which any person entering into occupation of any premises previously supplied with gas by the Corporation shall not require a supply of gas or to hire all or any of the pipes, meters, fittings, or apparatus belonging to the

Corporation. For refusal to allow entry, a penalty not exceeding £5 and a daily penalty not exceeding £2 are proposed. Where premises are unoccupied, the Corporation may, after giving not less than forty-eight hours' notice to the owner thereof, or if he is unknown to the Corporation may, after affixing a notice upon a conspicuous part of the premises, forcibly enter them, doing no unnecessary damage. Provision is also made for the fixing of a valve where high-pressure air is used in connection with the consumption of gas. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

APPARATUS FOR INDUSTRIAL RESEARCH.

A most useful catalogue of apparatus has recently been published by Messrs. A. Gallenkamp & Co., Ltd., of Finsbury Square, E.C. 2. The well-written descriptive matter relating to the different pieces of apparatus is prefaced by a series of tables of atomic weights, compositions of freezing mixtures, melting points of chemical elements, &c. Of considerable interest is the section dealing with pyrometry. In the present state of technical knowledge in the matter of heat control, it is unnecessary to emphasize the need of a pyrometer for every important heating process; only by the systematic checking of temperatures can good results be repeated, and bad results avoided, with certainty. The ability to measure from a distance the temperature of an inaccessible part of a furnace is often of great convenience; and as in high-temperature operations the life of a radiation pyrometer is not limited by any destructive action of the heat, this instrument is particularly applicable to the purpose. The "Fixed Focus" pyrometer described in the catalogue is stated to require a minimum of manipulation or adjustment before making a measurement, and is so robust that it can be placed with safety in the hands of the ordinary furnace-man. The receiving tube is pointed at the hot body, and receives a portion of the radiant heat therefrom. This radiation is focussed on the junction of a small thermocouple, and thus generates an electric current—which is used to actuate an indicator—proportionate to the temperature of the hot body. Where the receiving tube is to be fixed permanently, but a permanent opening in the furnace wall is not allowable, a fixed housing may be used. This provides a socket for holding a closed-end refractory tube, and has a flange for attachment to the furnace wall. Fitting accurately to this flange is the outer part of the housing, which definitely fixes and controls the alignment of the receiving tube. This arrangement allows of the handling of the latter in the housing, part of which is adapted for water cooling.

The "C" optical pyrometer may also be mentioned. The instrument may be regarded as a photometer, in which, by rotating the eyepiece, a beam of selected monochromatic light from the hot body is adjusted to equal intensity with a beam of similar light from an electric lamp. Behind the enlarged part in front of the pyrometer, in which is fitted the electric lamp, are two holes. Light from the object under observation passes through one, and that from the lamp through the other. These beams are then polarized and rendered monochromatic. Finally, they pass through a single ocular. The observer sees an illuminated circular field divided into two semi-circles, one of which is filled by an image of the hot body under observation, and the other uniformly illuminated by the electric lamp. The two semi-circles are brought to an equal intensity of illumination by turning the eyepiece, to which the scale pointer is directly attached. As the accuracy depends on the constancy of the light from the electric lamp, a small ammeter and regulating resistance are fitted in the box containing the accumulator. To ensure that the candle-power shall remain constant over long periods as the filament ages, provision is made for calibrating the instrument against a standard amyl-acetate lamp. This test need only be made at long intervals, and the standard lamp need not be carried into the works.

Another optical pyrometer of interest is the "F" disappearing filament type. The main feature of this is the so-called "Lamp-Bridge Unit." The pyrometer lamp is placed in one arm of a Wheatstone bridge which has ratio arms of manganim. A resistance, also of manganim, is adjusted so that, with the lamp running at any particular temperature, the bridge is balanced. The zero of the scale thus corresponds with this reading. If now the current in the bridge is increased, the temperature of the lamp increases, and also its resistance. This will cause an out-of-balance deflection in the indicator, which is calibrated to suit requirements.

German Fuel Enterprise in the United States.—The New York correspondent of "The Times" states that Herr August Thyssen, the German industrialist, has secured options on a number of the lignite fields of North Dakota, and is preparing to enter the American fuel industry. Dr. Hans Holzwarth, of the Thyssen Company in Mannheim, on his return to Minneapolis, after visiting the fields, was reported to have said that the Company had a new briquetting process which, by rotary distillation, removed the tar, gases, and other bye-products from lignite, and produced a coke of an efficiency equalling that of anthracite. This could be produced and sold in Minneapolis at $8 a ton, or several dollars less than anthracite.

THE FUEL OF THE FUTURE.

Extracts from a Lecture Delivered by Mr. F. W. Goodenough at King's College, London, on Jan. 3.

The subject that I have taken for my lecture is "The Fuel of the Future." By that I mean the fuel which is in my opinion destined more and more to become generally, though I am not optimistic enough to imagine that it will (at any rate in my lifetime) become universally, adopted in this country. The fuel of the future I believe to be gas, with its companion product of coal carbonization, coke. To establish the case for this faith, it is necessary, obviously, to prove that gas and coke are the most efficient of fuels, using the word in its widest sense.

Speaking broadly, there is no alternative to coal as the basic fuel in this country. The possible alternatives—wood, peat, oil, water-power—are either impracticable or only available in negligible quantities. Our industrial existence, our national prosperity, depend absolutely on the efficient production, transport, and utilization of our coal resources, coupled with our supplies of iron. And there is no substitute in sight. In ancient mythology, fire was a stolen gift from heaven; but we cannot rely on a second Prometheus to come to our rescue when our coal resources are exhausted—and these are by no means unlimited. Spasmodically—ever since Edward Hull and Stanley Jevons in the sixties of the last century called our attention in no uncertain language to the urgency of this problem of our dwindling coal resources—we take interest in the subject, write letters to the papers, ask questions in Parliament, and finally appoint a Royal Commission. But then, on learning that we have enough coal to last 600 years at our present rate of consumption, we dismiss the subject from our minds, regardless of the qualifying facts of the case.

The Problem of Cheap Coal.

The problem is not merely how long the coal will last at the present—or even at an increased—rate of consumption, but how long we can win and deliver it to the user at a price that will enable our industries to compete with those of America, Germany, and Japan. While our Commissions lull us to sleep with the information that we have as yet 200,000 million tons of coal, the United States have 4,000,000 million tons of coal, Canada has 1,000,000 million tons, and Germany has 400,000 million tons. Moreover, Germany uses little more than half, while the United States do not use double, the amount that we take from our mines annually. It is therefore imperative that we should ensure the highest economy, and eliminate waste to the utmost, in the production, transport, and use of coal.

Indefensible Waste.

We have been slowly and with difficulty collecting £250,000 to restore Westminster Abbey, and we shall want many more quarters of a million pounds to make good the ravages wrought upon other historical buildings in other towns and cities by the inefficient use—the positive abuse—of our coal wealth. Our hospitals and sanatoria are filled with the victims of our smoke-shrouded towns and cities—victims created by waste, whom efficiency would have preserved. This is clearly shown by the experience of New York. Fifteen years ago, after much agitation, laws to prohibit the smoke nuisance were passed—and were not only passed, but enforced—with the result that the atmosphere there to-day is entirely untainted by smoke. In fifteen years the death rate from tuberculosis was reduced 66 p.ct. At the beginning of the century pulmonary consumption killed 39 persons per 10,000 in New York; to-day the figure is 13 per 10,000. In this country we are spending money in enlarging our hospitals, our sanatoria, our cemeteries, that should be spent in enlarging our gas-works.

It has been estimated—more, it has been proved—that a net saving of at least £30 can be saved per house if, instead of building chimney flues adequate for the removal of the products of the direct burning of crude coal, there were provided flues only sufficient for the carrying-off of the products of combustion from gas-fires. This fact has been recognized by the Ministry of Health, who have called the attention of housing authorities throughout the country to the facts. If it be true that a million houses will have to be built in the next ten years, is it thinkable that we should deliberately waste something like 30 million pounds in building those houses on a pattern that is becoming rapidly obsolete? But it may be said: Cannot these economies be effected, cannot smoke be abolished, labour saved, cleanliness assured, and building economies effected, and cannot our coal supplies be conserved, by using electricity as our fuel in place of crude coal? It is true that the report of the Coal Conservation Sub-Committee, appointed by the Ministry of Reconstruction, gave many people the impression that all these good things—and more also—were to be secured by the waving of Electra's fairy wand. The general public were led to believe that by the erection of a number of super generating stations a supply of electrical energy could be distributed to every hamlet, village, town, and city in the country, indeed, to every cottage and farm, at such a price as would make it possible for electricity to displace both coal and gas, not only for power and light, but also for all fuel purposes throughout the land; and they were led to believe that such conversion of coal

into electrical energy at central super-stations would result in coal conservation and economy. But a critical examination of this promise—or hope—very soon revealed its unsubstantial character and proved it to be without any foundation in fact—proved, indeed, that waste, and not efficiency, lay in the adoption of electricity for fuel purposes.

The Limitations of Electricity.

The error into which not a few people fall is that of regarding the possibilities of electricity as without limit, and of imagining that some day, somehow, electricity will be able "to do everything" without any call, or with but a negligible call, upon the sources of our national wealth. The great insuperable obstacle to the economical generation, distribution, and utilization of heat in the form of electricity in this country is that there is, speaking broadly and practically—and not forgetting the Severn—no means of generating electrical energy other than by the conversion of the potential heat energy of coal into electrical energy; and that is a most wasteful process. Sir Dugald Clerk and Profs. Cobb and Smithells, who investigated the question of the relative efficiencies of coal gas manufacture and electricity generation, from the point of view of coal conservation, and published a report on the subject which has never been challenged in any serious or effective manner, showed that the average electricity generating station of to-day destroys coal containing 100 heat units in the process of delivering to the consumer 7 heat units in the shape of energy—a loss of 93 p.ct.; that the most efficient generating station to-day shows a loss of 88 p.ct.; and that the best result anticipated for the suggested "super" stations is an efficiency of only 18 p ct. Further, out of every 100 heat units in the coal carbonized at "good practice" gas-works of to-day (in round figures) 50 are returned to the solid-fuel market as coke; 5 are recovered as tar; 22·5 are lost in manufacture and distribution, and 22·5 reach the consumer as gas. Hence, out of 100 heat units in the coal carbonized, 77·5 are delivered to the community, and only 22·5 are lost; while out of the heat units that do not reappear after the process of carbonization as anything other than gas 50 p.ct. are delivered as gas to the consumer. In the gas-works of the future it is possible that coal will be as completely as possible gasified, and that 75 heat units out of every 100 in the coal treated will be available for distribution as gas, as against 18 out of 100 available if the distribution be in the form of electric energy. After allowing in both cases for all losses in transmission and utilization—that is, after giving electricity credit for its somewhat higher "efficiency of utilization"—there would be involved in the doing of equal heat work for the consumer the destruction of 4 tons of coal at the electricity station of to-day, as compared with 1 ton at the gas-works of to-day; or 3 tons at the super-station of the future, as against 1 ton at the gas-works of the future. To give the gas consumers of to-day equal service to that rendered for a destruction (net) of 10 million tons of coal, the electric generating stations of to-day would destroy 40 million tons, and the "super" stations 20 million tons at least—and in so doing would destroy all the valuable bye-products recovered when coal is carbonized. To displace by gas the 40 million tons of coal now used for domestic fuel (these are figures deduced from Sir Dugald Clerk's data and the Coal Controller's estimated gas equivalent of coal for fuel purposes) a net destruction of only 30 million tons would be involved if gas produced at the works of to-day were used; whereas if electric energy were employed, 120 million tons would be destroyed at the generating stations of to day, or 60 million tons at the super-stations if they proved as economical in coal consumption as was promised.

The Consumer's Viewpoint.

These facts and figures are interesting and important from the national and communal points of view. As far as these are concerned, the case for gas fuel economy is conclusive; but there remains to be considered fuel efficiency from the point of view of cost to the individual user; because, if it is more costly for him to use gaseous fuel than to use crude coal, he will, if he be a business man, feel compelled, and if he be a private householder, be strongly inclined, to continue to use crude coal, in spite of the arguments from the public aspect in favour of gaseous fuel.

How do the cases stand for the use respectively of gaseous fuel, crude coal, and electricity, from the individual consumer's point of view? First of all, it is necessary to point out and to emphasize strongly the fact that in considering the question of costs we must have not merely regard to fuel cost compared with fuel cost, but we must take into consideration the domestic or industrial budget as a whole—we must take into account the questions of waste or economy of transport, health, energy, time, storage space, &c., to which I have already referred, before we can pass a final verdict as to comparative cost in any given case. For continuous firing, either for industrial or domestic purposes, fuel cost for fuel cost, gas at any price at which it can be commercially supplied to-day is dearer than coal or coke. For intermittent use, fuel cost for fuel cost, it is generally as cheap (it is sometimes actually cheaper), and by reason of its incidental economies easily holds the field.

I have worked out what I believe to be reliable comparisons of the cost (the fuel cost only) of useful heat to the consumer, obtained by the use respectively of coal, coke, gas, and electricity. I have taken coal and coke at 50s. per ton, gas at 8d. per therm, and electricity at 2d. per unit.

Set out in tabular form the figures are as follows:

	Per Therm of Useful Heating.
Coal (50s. per ton)	costs from 9d. to 27d. (*a*)
Coke (50s. per ton)	,, ,, 8d. to 12d. (*b*)
Gas (8d. per therm)	,, ,, 10d. to 18d. (*c*)
Electricity (2d. per unit). . . .	,, ,, 60d. to 80d. (*c*)

(*a*) According to whether required for regular or intermittent heating.

(*b*) Only comparable in cases where fairly constant heating is required.

(*c*) According to efficiency of utilization, varying in different processes.

For constant use, coke is the cheapest fuel if cost of fuel alone is considered. This is particularly so in regard to steam-raising. Gas used in the most favourable circumstances is actually cheaper in direct fuel cost than coal used under the most unfavourable conditions.

Gas for Intermittent Heating.

For intermittent use gas easily beats all comers. No one would suggest using coke for intermittent heating; and for this reason I have included no figure for its cost in such circumstances. As an actual and striking instance of gas showing a direct money economy over coal, I may mention that at an infirmary in London some time ago gas cooking stoves were installed in all the ward kitchens in place of coal ranges, with the result that a saving of no less than £1200 a year was made in the fuel bill, without making any allowance for the savings effected in labour, dirt, and the heavy wear and tear on the coal ranges. The coal required to produce the gas consumed in lieu of the coal burnt in its crude form shows a saving of 400 tons of coal per annum, *plus* 100 tons of coke available for sale. This is a striking, but by no means a solitary, example of gas fuel efficiency. Again, the use of gas in industrial processes, by reason of the constant maintenance of temperature and the possibility of exact heat regulation, frequently leads to a higher and more uniform quality of product, a much lower percentage of rejects, and a greater certainty of output. Moreover, it frequently results in an increase of output per machine per hour, and secures healthier and less exhausting conditions for the employees engaged in the operations.

What is true in the factory and workshop is also true in the home. I had a striking instance of this fact, and of the failure of the consumer to appreciate it, some years ago when I was visiting a nursing home. I found that gas was used throughout for heating, for cooking, and for hot-water supply. On my first visit, when in conversation with the matron-proprietor of the home, I referred with satisfaction to the general use of gas, and expressed the hope that she found the system satisfactory in every respect. She replied: "Oh yes, very satisfactory, except in regard to cost. I have to pay very heavy gas bills." "I suppose that you find an advantage in the saving of work secured by the use of gas?" "Oh yes," she said, "I got rid of a maid at the time I put the gas-fires into the house, which frequently save the cost of a night-nurse, for, when all the patient requires is to be kept warm, I can leave the gas-fire alight, and it needs no attention." I said nothing more at the moment, but took an early opportunity of referring to the ledger in which was kept the gas account; and the next time I called I said to the matron: "By the way, I see your gas costs you nothing." "Nothing? Why, I paid your Company £20 only the other day." True," I replied, "but I think you told me that you saved a servant through the use of gas; and you would agree that a servant costs not less than £60 a year for wages and keep?" "Yes, certainly, I should say quite as much," she replied. "Then in that case our account shows that your gas costs you less than the wages and keep of a servant; and you save your coal bill into the bargain." My friend had never looked at the subject in that way before; but as a result of our conversation she wrote me a letter which has been one of our most valuable pieces of evidence as to the economy of gas.

Rapid Increase in Use of Gas Appliances.

The proof of the fuel is in the heating. The most convincing fact of all is, I think, the enormous and progressive increase in the use of gas-fires, cookers, and water-heaters (for which there is a great demand) throughout the district of the Company which I have the honour to serve. In the last ten years the number of gas-consuming appliances of all descriptions sold or let on hire by the Company, in addition to any appliances purchased privately, increased by no less than 478,000, in spite of all the difficulties experienced during the period of the war and since; and when it is realized that there are now no less than 852,000 gas-consuming appliances in the district used by consumers through penny-in-the-slot meters, who have to study economy first and foremost, little more need be said in proof of the assertion, which I make with confidence, that experience has proved that the use of gaseous fuel is in the majority of instances as advantageous to the user as it is desirable from the point of view of the community as a whole—that it is in the carbonization, instead of the combustion, of coal that we can get nearest to the ideal of 100 p.ct. in fuel efficiency; and that for the various reasons—domestic, industrial, communal, and national—which I have briefly set forth, gas is destined to be the fuel of the future.

AMERICAN GAS ASSOCIATION.

Some Notes from the Papers and Reports.

(*Continued from p.* 35.)

Carbonization and Complete Gasification of Coal.

One of the most lengthy reports submitted was that of the Committee on Carbonization and Complete Gasification of Coal, under the Chairmanship of Mr. R. G. Porter, of the Philadelphia Suburban Company, Chester (Pa.). The report consisted of several sections, and one of these—"A Study of Some Physical Laws Governing the Carbonization of Coal," by Mr. A. W. Warner—we are reproducing in the "JOURNAL." In the Operator's Section, Prof. D. J. Demorest, of Ohio State University, Columbus, contributed an article on "Carbonization Yields from Run-of-Mine, Slack, and Three-Quarter Inch Coals," and Prof. D. W. Wilson, of the Massachusetts Institute of Technology, one entitled "The Mechanism of High-Temperature Coal Carbonization."

Introducing the Complete Gasification of Coal Section, Mr. W. R. Morris, of Jersey City (N.J.), said it was the purpose of the report to consider, under "complete gasification," a process which gasifies coal so that no solid residue other than ash remains. Two-stage processes, which are thoroughly established, were not within the scope of the report, the primary object of which was to deal with a single-stage process. In past reports descriptions have been given of various complete gasification systems, and their theoretical possibilities fully discussed; and, so far as the Committee could learn, no new processes have been put in operation since last year's report. The one method which, Mr. Morris says, seems to be pushing itself forward as a theoretical possibility is that of producer gas made from pure or 90 p.ct. oxygen. Numerous investigations of this system have been made; and attached to the report was an article by Mr. Willien on this subject. "To those familar with the simplicity of producer plant operation," comments Mr. Morris, "it is most attractive to think of making in that manner a gas of 350 to 375 B.Th.U. value. The first obstacle is that of cost of manufacture of the oxygen, and the next is the doubt as to what would happen in the hot zone of a producer when pure oxygen instead of air was used."

Complete Gasification by the Use of Oxygen.

Mr. L. J. Willien, of Messrs. Charles H. Tenny and Co., Boston, in the article contributed by him to the report, which is referred to above, presented the gist of the data available on the proposed process of completely gasifying coal in a producer using 90 p.ct. oxygen and steam continuously, instead of air and steam intermittently. The figures given in connection with the operation to be expected from such a process were all derived from theoretical or, in some cases, arbitrary consideration of the system. The use of oxygen instead of air in gas producers was discussed in a paper submitted to the Institution of Gas Engineers in 1920 by Mr. H. J. Hodsman and Prof. J. W. Cobb; and in the following year Mr. E. W. Jefferies, of the Jefferies Norton Corporation, Worcester (Mass.), read a paper on the same subject before the New England Association of Gas Engineers. Prof. R. S. Tour, of the University of Cincinnati, has also prepared figures in connection with the matter. Information gleaned from these sources is set forth in the accompanying table.

Oxygen in Gas Production.

—	Prof. Tour.	E. W. Jefferies.	H. J. Hodsman and J. W. Cobb.	
			Carbonization with Steam.	Complete Gasification.
C.Ft. gas per ton of coal . .	63,500	66,340	18,650	61,700
Steam required per ton of coal (lbs.)	1,810	600	118	674
Steam required per 1000 c.ft. of gas (lbs.)	28·5	9·05	6·34	10·9
C.Ft. oxygen required per ton of coal	14,350	13,600	2,030	11,000
C.Ft. oxygen required per 1000 c.ft. of gas*	226	205	109	178·5
Composition of gas—				
Carbon dioxide . . p.ct.	7·7	3·0	1·1	0·33
Illuminants . . . ,,	0·6	1·4	1·1	0·35
Oxygen . . . . ,,	0·0	0·0	0·1	0·06
Carbon monoxide . ,,	51·4	58·0	41·9	63·20
Methane . . . . ,,	5·2	7·6	14·2	4·26
Hydrogen . . . . ,,	32·2	28·0	38·3	30·80
Nitrogen . . . . ,,	2·9	2·0	3·3	1·00
	100·0	100·0	100·0	100·00
B.Th.U.	341	375	427	352
Specific gravity	0·67	0·65	0·57	0·74

*90 p ct. oxygen, 10 p.ct. nitrogen.

In each case, Mr. Willien points out, the resultant gas is too low in heating value to meet the legal requirements of the United States, and therefore enrichment would be necessary. He thinks that probably the best arrangement at first would be parallel operation of the oxygen producer with an intermittent carburetted water gas installation supplying a high B.Th.U. gas for admixture. The ability to control the temperature of the hot zone in the oxygen producer is, to his mind, something which may prove to be a problem; but really the proposition of using oxygen in gas producers is dependent upon being able to obtain cheaply a 90 p.ct. oxygen. Reducing the purity of the oxygen lowers the cost of production in a much greater ratio than the reduction in purity, and this is the reason for considering the use of 90 p.ct. oxygen—even 85 p.ct. oxygen would be suitable. The complete gasification of coal by the use of oxygen is, Mr. Willien finally declares, the most promising proposition that has been put forward. If 90 p.ct. oxygen can be manufactured at a cost of 50 c. or less per 1000 c.ft., its use in the production of gas assumes a very interesting aspect, and the gas industry should proceed to determine the feasibility of the process. He believes it will eventually be possible to produce commercially 90 p.ct. oxygen at a cost not exceeding that named, and to use this oxygen with steam and gas coal in a producer completely gasifying the coal, and leaving only the ash as a residue.

Low-Temperature Carbonization.

The report of the Low-Temperature Carbonization Section of the Committee on Carbonization, bearing the signature of Mr. Charles V. M'Intire, of New York, as Chairman, contains a brief outline of the work which is under way in the United States for commercializing low-temperature carbonization, and indicates also the main lines of some of the processes now before the public in England and Germany. In the first place, however, the report says: "There have been no developments along low-temperature lines in this country or in England which would justify any assumption that the art has passed from the experimental into the commercial field." The Committee further set down the opinion "that low-temperature coke is not inherently superior to coke-oven coke, unless it is improved physically by briquetting or some other means."

Some observations on the mixing of coals for carbonization, by Mr. Joseph D. Davis, Fuel Chemist to the United States Bureau of Mines, are included. For a number of years it has been considered good coke-works practice to mix coals of high volatile matter content with low-volatile coals, in order to secure cokes of dense structure suitable for blast-furnace use; but in so far as gas-making properties are concerned, there is, Mr. Davis says, probably little to be gained by mixing coals. In the latter case, the main requirements are that the coal shall yield the maximum percentage of its calorific value in the form of gas, and that the coke produced shall be of marketable quality. Obviously, more research is needed to show just what properties are required of metallurgical coke. Then one might proceed intelligently to build up to specifications a synthetic coke—for example, briquetting a low-temperature coke with sufficient pitch binder, and carbonizing the briquette at high temperatures. It might even be possible so to modify gas-works coke as to bring it within these specifications. The economic aspects of the question present a specific problem to which more attention must be given. In synthesizing coke from low-grade or low-rank materials, one must keep in mind the competition of raw materials now available which will produce the desired coke by direct and well-developed processes. For the present it seems doubtful that synthetic cokes will compete, particularly where much modification of present processes is entailed. However, when the present supply of good coking coal is depleted, industrial development of synthetic coke may be expected.

Rate Structure.

The Committee on Rate Structure—under the Chairmanship of Mr. T. V. Purcell—opened their report by remarking that the subject is not a new study, inasmuch as forty years ago Mr. Norton H. Humphrys, in a communication to the "GAS JOURNAL" (or "Journal of Gas Lighting," as it then was), referred to the necessity of analyzing costs for the purpose of rate making. Since that time the question of correct pricing has been discussed year after year before the national associations of both the gas and electrical industries; but, notwithstanding this, the astonishing fact remains that little or no real progress has been made in the gas industry in this most important matter. It is of vital importance that progress be made in the development of uses for gas other than for lighting and cooking; and this is equivalent to saying that, if scientific rates were desirable twenty-five years ago, they are imperative now. Unless the gas industry offers the customer who makes long-hour use of his demand a rate much closer to the actual cost of serving him, the industry cannot begin to compete with other fuels. What is needed in this regard is, first, a study of costs as divided into the three parts "customer," "demand," and "commodity" (giving consideration to sub-divisions of demand); and, secondly, a classification or tabulation of customers according to amount of monthly consumption, and in connection with such tabulation a study of the kinds of customers that make up the various classes. Such a study will show who are the small customers, and who are not. It will appear therefrom that the labouring man is not as a rule the small customer, but that his consumption is very near the average of all domestic customers. However, while the Committee urge a study of the fundamentals of rate structure, to the end that rates may be made equitable and competitive, they realize that some departure from the results of strict cost analysis must, and will, be made for reasons of practicability.

(*To be concluded.*)

Dr. John Allen Harker, O.B.E., F.R.S., formerly Director of Research at the Ministry of Munitions and Chief Assistant at the National Physical Laboratory, who died on Oct. 10, aged 53, left estate of the gross value of £6739, with net personalty nil.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

The Fourth General Meeting of the session was held at the Cardiff Technical College, Cathays Park, Cardiff, when the President (Mr. T. A. Canning) took the chair, and introduced in a few well-chosen words Mr. H. W. Webb, M.Sc., Chief of the Industrial Chemistry Department of the Technical College, who had agreed to address the members, the subject being "The Luminosity of Flames." Mr. Webb illustrated his lecture by experiments.

LUMINOSITY OF FLAMES.

The primary cause of flame is, of course, combustion, though all combustions are not accompanied by flame, as, for example, that of iron wire in oxygen. In general, when the substances taking part in combustion are gases or vapours at the temperature of ignition, then the phenomenon of flame is present. In order that the flame should continue, it is essential that the heat of combustion should maintain the temperature at or above the ignition point of the combustible substance. The ignition point varies with different substances; carbon bisulphide, for example, ignites at the temperature of a hot glass rod, while other substances are spontaneously inflammable at atmospheric temperature.

All flames have a characteristic structure which differs with the materials undergoing combustion. I propose to limit the discussion to the coal-gas flame, in which, I assume, you are most interested. By causing the flame of an air-coal-gas mixture to impinge on a piece of clean wood, the flame appears to consist of only two parts—an inner cone which scarcely affects the wood, and a very hot outer section which chars it. The flame is not, in fact, so simple as this; but it is unnecessary at this stage to discuss the structure in detail. The important points to notice are: The zone of unburnt gas—from which gas may be drawn off by a glass tube and ignited; the small blue mantle round this, where partial combustion is taking place; and the main (and hottest) zone of the flame, where combustion is mainly completed.

In studying the chemical changes which occur in the bluish-coloured zone and the main zone of combustion, difficulty is experienced in isolating the products at definite stages of combustion. Two methods by which this difficulty has been partly overcome are: First, by reversing the flame, and apparently burning air in coal gas; secondly, by dividing the non-luminous flame into two parts by means of co-oxial tubes made to slide one within the other. In this way, the chemical changes undergone by the combustible substances can be more easily followed. One of the greatest differences observed in different flames is their degree of luminosity; and I want to consider very simply the factors which affect the luminosity of a coal-gas flame.

TEMPERATURE.

It can be shown in a number of ways that the temperature of a flame has an important influence on its luminosity. If we depress a cold flat-iron on to a luminous flame, the flame loses its luminosity. The same effect is also observed by lowering a coil of copper wire into the flame. If we add to the combustible gases an inert gas, which will therefore lower the flame temperature, the flame loses its luminosity entirely. If, on the other hand, we pre-heat the coal gas before combustion, the luminosity of the flame is greatly increased.

DENSITY.

It is well known that a candle burning at high altitudes has very little luminosity; and there is the same effect when the pressure of air in a bell jar, under which a candle is burning, is reduced by means of a vacuum pump. A decrease in the density of air decreases the luminosity by lowering the flame temperature. An increased density of coal gas or air has exactly the opposite effect up to a certain limit. The explosion of the gases hydrogen and oxygen, under several atmospheres pressures, is brilliantly luminous.

PRESENCE OF SOLID MATTER.

Provided the flame temperature is sufficiently high, probably the most important factor in luminosity is the presence of solid matter in the flame. That solid particles of carbon are present in the ordinary luminous flame of hydrocarbons can readily be shown by depressing a cold porcelain tile on to the flame. The tile rapidly becomes coated with a sooty deposit. A more positive demonstration of the influence of solid particles on luminosity can be made, however, by adding to the combusting substance compounds rich in carbon, or finely-divided materials whose particles are known to incandesce at high temperatures. By rubbing two pieces of charcoal near the air inlet of a bunsen burner consuming gas with a non-luminous flame, you notice that the flame becomes luminous. By bubbling coal gas through benzene before ignition, you observe the flame becomes very much more luminous; benzene being a substance which gives relatively large quantities of carbon on combustion. The flame of ethyl alcohol is non-luminous; but, by injecting chlorine into the alcohol vapour before ignition, the flame becomes luminous. Chlorine is known to decompose alcohol at these temperatures, causing the formation of large quantities of carbon from the alcohol. If we vapourize salt (sodium chloride), lithium chloride, or boric acid, in each case the non-luminous flame becomes luminous, and incidentally takes on a colour characteristic of the substance injected.

These experiments suggest that the luminosity of the ordinary coal-gas flame burning at a batswing jet is due to the production of carbon particles in the flame, which are made incandescent. The mechanism by which the carbon particles are produced in the flame is not, perhaps, fully established. The carbon may be produced by the direct decomposition of hydrocarbons such as methane and ethylene into carbon and hydrogen at the temperature of the flame—an improbable explanation. It may also be due to the preferential combustion of hydrogen in a hydrocarbon (the air supply being insufficient). This explanation again must probably be rejected, for reasons into which I have not time to enter. Finally, it has been clearly established that acetylene is produced in a luminous coal-gas flame. Its quantity increases from the mouth of the burner—*i.e.*, the base of the flame reaches a maximum at the beginning of the luminous zone. It is also known that acetylene decomposes almost explosively above a certain temperature, yielding carbon particles. These factors suggest that in coal-gas flames the carbon particles are due to the initial production of acetylene by the decomposition of methane and other hydrocarbons—an explanation which seems to be substantiated by experimental evidence.

There is still to be explained the action of air in rendering a luminous coal-gas flame non-luminous. The nitrogen in the air, being non-combustible, acts as a diluent, and tends to lower the flame temperature. It is well-known, however, that the temperature of the non-luminous bunsen flame is much higher than that of the luminous flame, so that the lack of luminosity cannot be due to lower flame temperature. The explanation is found in the action of the oxygen, which causes the complete combustion of the hydrocarbons into oxides of carbon and water, at a very rapid rate, and prevents the intermediate production of carbon particles, which latter are only produced when there is insufficient oxygen present for complete combustion.

I have dealt briefly with the luminosity of coal-gas flames, in order to illustrate in a superficial manner the theoretical principles underlying such flames. You are not technically interested, however, in the production of luminosity by carbon particles, for the obvious reason that, in order to produce such flames, the air supply must be insufficient, and the flame temperature relatively low; while the luminosity of such incandescent particles is known to increase with rise in temperature. The calorific value of the gas is therefore kept as high as possible, and the principle of injecting (in effect) incandescent particles into the flame is adopted. In actual practice a cotton mantle is soaked in a mixture of oxides of thorium and cerium, and then coated with collodion to stiffen it. In shape it is made to coincide as nearly as possible with the plane of maximum temperature in the flame. The oxides, on being heated, incandesce brightly, and give the characteristic luminous appearance of the ordinary domestic burner.

Discussion.

The PRESIDENT said that the subject was one of great interest, and the experiments had proved valuable and instructive. The theory and structure of coal-gas flames were subjects now in the limelight—at least with regard to the gas industry. Mr. Webb had wisely not committed himself to any statements concerning flame temperature, which was an abstruse problem. Flame temperature had baffled the cleverest and most learned scientists and chemists; and it seemed that they were just as far from the true solution of the problem as ever. Conclusions had been drawn in the past that the presence of inerts had the effect of reducing the calorific value and flame temperature of coal gas, and efforts had been made to establish a definite relationship between the two. On this point certain conclusions had actually been put forward in the past, but had crumbled like dust under the influence of the contradictory results of further experiments. He thought it had been fairly well established that the temperature at different portions of a gas flame varied with the composition of the gas supplied to the burner. It gave him the greatest pleasure to propose a vote of thanks to Mr. Webb for his lecture, which had involved much time and trouble, and he wished to couple in that vote Mr. Rudge, who had ably assisted the lecturer in his experiments.

Mr. D. M. JOHN (Aberdare) seconded, and congratulated the lecturer on the comprehensive manner in which the ground had been covered. Personally, he thought that Mr. Webb had given valuable instruction on combustion, particularly to those who were not actually engaged on the technical side of the industry.

The HON. SECRETARY (Mr. B. J. Bell) supported the motion, and said that combustion was becoming a most important matter. While the luminosity of a flame was not so necessary as it had been, the principles must be thoroughly understood before the whole subject could be grasped. The relation between calorific value and flame temperature was not understood; but there would be considerable research in the future in this connection. With the advance in the use of gas in large quantities for heat treatment of metals, &c., the questions of radiation, refractory material, and dissociation of gases were continually arising. These points would no doubt be dealt with at a later date.

Mr. H. T. LEWIS (Abertillery) voiced his appreciation of Mr. Webb's address.

Mr. F. H. OSBORNE (Cardiff) also supported the motion.

Mr. WEBB, in reply, said that he had listened to the remarks with pleasure, and agreed that combustion and flame were matters which attracted the chemist, and must be thoroughly interesting to an industry which depended upon heat for its success. If the Association wished, he would at some future time deal with flame propagation and combustion phenomena.

A LARGE GAS-HEATED STAFF KITCHEN.

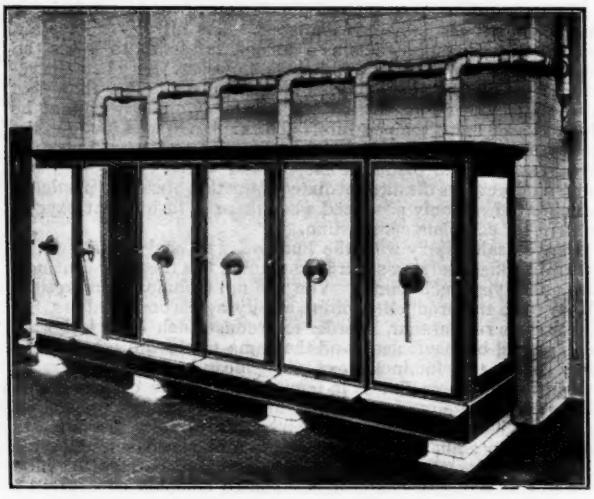
IT is improbable that there exists in the country another cooking plant of its size more completely operated by gas than that recently installed for Messrs. Bourne & Hollingsworth in their Oxford Street staff kitchen, where nearly 1500 employees are catered for daily—dinner being prepared for this large number, besides other meals. If such another exclusively gas cooking installation could be found, we should be surprised to learn that it was equipped so completely with the apparatus of one manufacturer as is this one with the appliances of the Davis Gas Stove Company, Ltd.

The installation, of which we are able to give some photographs, and which was supplied through the Gas Light and Coke Company, includes, in the kitchen, a range of eight "Metropolitan Diamond" ovens, with a continuous hot-plate, the ovens being provided with white enamelled linings; two ranges of roasting ovens; and a range of pastry ovens. There are two 30-gallon steam-jacketed pans used as stock pots; the inner pans being enamelled white, and so arranged that every part of the pan is exposed to view on the cover being raised. Five 55-gallon steam-jacketed pans are provided for boiling meat, &c.; the pans being similarly arranged to those just mentioned. Each has a draw-off cock so made that either soup can be taken off in the usual way or waste water, &c., run off down the drain, according to the direction in which the handle is turned. A range of six steam cooking chests is used mainly for puddings. There are four potato steamers, each of which is fitted with a number of perforated trays. Hot closets, carving tables, and vegetable warming apparatus are also to be found in the service rooms.

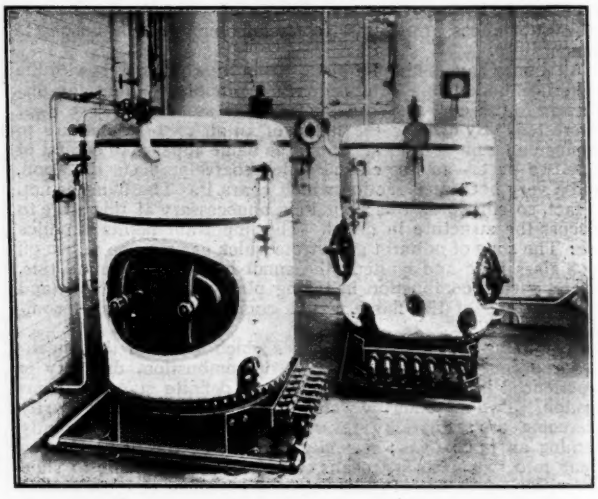
In the boiler-house, two Davis multitubular gas-heated steam-boilers, of approximately 6 H.P. each, and each with a heating surface of 60 sq. ft., supply the steam to the pans, steam chests, potato steamers, and vegetable sinks. The boilers are fitted with an automatic regulator for shutting down the gas when a certain steam pressure is attained.

The whole of the apparatus has been in operation now for some six months, and is giving every satisfaction.

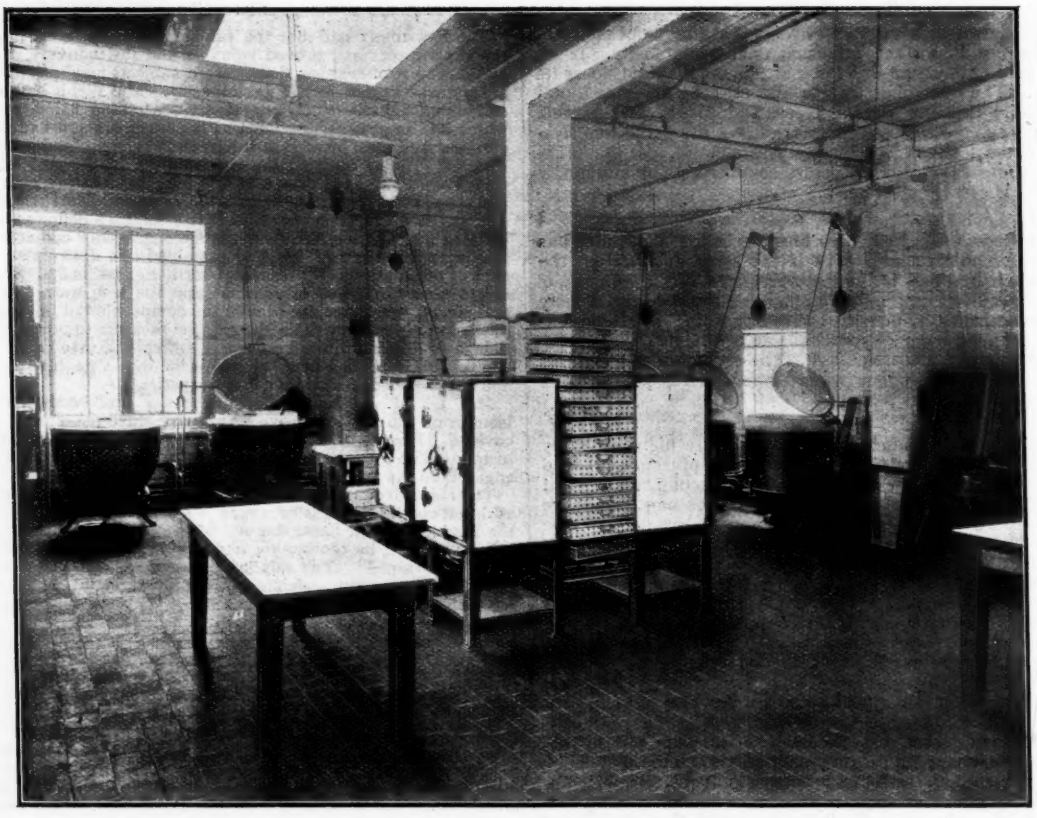
Gas, as we have said, is used exclusively throughout the installa-



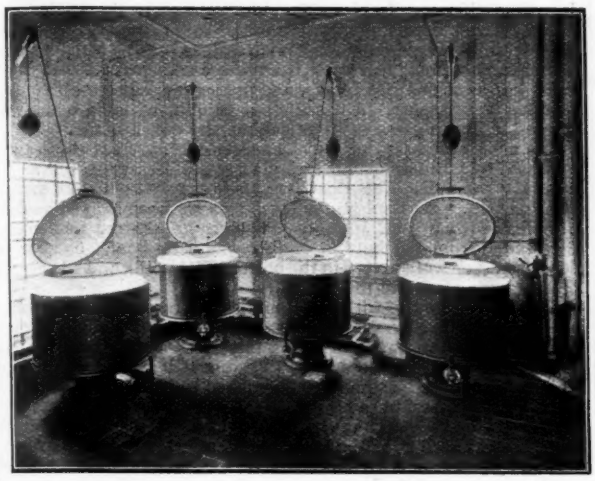
GAS-HEATED STEAMERS.



GAS-HEATED BOILERS GENERATING THE STEAM USED FOR STEAMING VEGETABLES, &c.

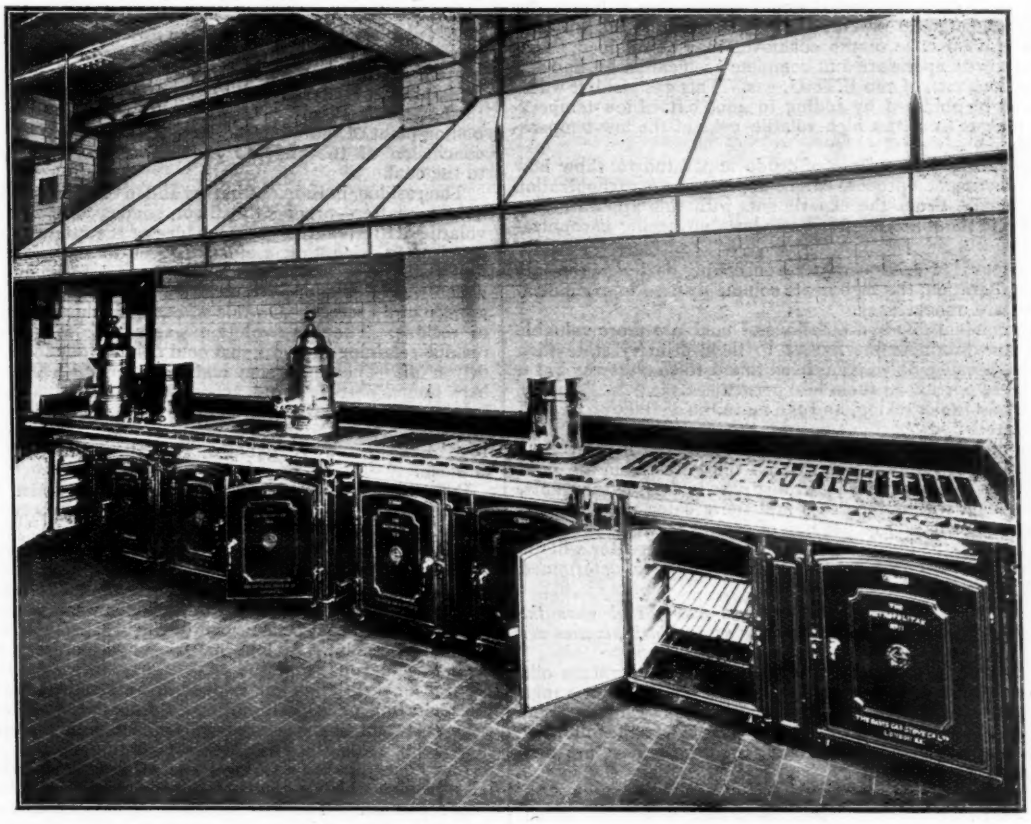


POTATO STEAMERS AND GAS-HEATED PANS.



A CLOSE-UP VIEW OF THE ENAMELLED STEAM-JACKETED PANS.

GAS-HEATED BAKING OVENS.



PART OF A BATTERY OF DAVIS "METROPOLITAN DIAMOND" GAS RANGES, CONSISTING OF A NUMBER OF OVENS, SURMOUNTED BY A CONTINUOUS HOTPLATE.

tion, and for this a particular reason is to be found in the fact that the kitchens and boiler and service rooms are situated on the top storey of Messrs. Bourne and Hollingsworth's building. Accustomed to value gas cooking for its cleanliness as one may be, one cannot help being impressed by the picture of spotlessness which the kitchen and other rooms present, and which is a standing advertisement for gas cooking.

The installation, which must be the most notable of its kind during 1923, also shows what the Davis Gas Stove Company, Ltd., can do in the way of large cooking apparatus, its design, manufacture, and equipment. We understand that the Company are busily engaged in the preparation of improved designs in apparatus of this type, and that before long a brochure on the subject will be published by them.

German Benzole and Ammonia Associations.—The report of the Benzol Syndicate of Bochum states that the question of the control of benzole was raised at the beginning of 1922, but as the compulsory deliveries to France continued, thus withdrawing permanently from the German inland market a product in great demand, there was a scarcity during the whole year. As the German production did not even approximately meet home requirements, the prices of benzene were the determining factor in the motor fuel market, and these in turn were determined by the currency. The year ended in a great disillusion, inasmuch as the Federal Monopoly Administration no longer placed at disposal at economic prices the spirit for the production of tetralit benzole, so that this business, which had been created at great expense, was completely ruined. According to the report of the German Ammonia Sales Association of Bochum for 1922, the sales of sulphate of ammonia continued under the terms of the agreements with the Nitrogen Syndicate, and were influenced by the economic conditions brought about by the depreciation of the currency. In consequence of this, sales substantially increased, so that the production of the Syndicate was fully taken up even in the usually quiet summer months. The output of the works forming the Association increased by 10 p.ct. in 1922. Difficulties were experienced during the year in procuring the amount of sulphuric acid needed for the manufacture of sulphate of ammonia.

A STUDY OF SOME PHYSICAL LAWS GOVERNING THE CARBONIZATION OF COAL.

By A. W. WARNER, of the Philadelphia Suburban Company, Chester (Pa.).

[A Section of the Report of the Committee on Carbonization and Complete Gasification of Coal submitted at the 1923 Convention of the American Gas Association.]

The years of experience in the carbonization and gasification of coking coal have brought forth three fundamental processes, typified by coke ovens, low-temperature carbonization, and complete gasification—prime quality coke, prime quality oils, and maximum gaseous B.Th.U. Between these conceptions are a multitude of variations. From a ton of coal the coke oven produces some 10,000 c.ft. of 550 B.Th.U. gas, 12 gallons of degraded tar, and the best grade of low-volatile coke; the low-temperature process produces some 4000 c.ft. of 1000 B.Th.U. gas, 23 gallons of oils, and a high-volatile coke or coalite residue; while complete gasification produces gas of varying volume and composition, 23 gallons of oil, and no coke. The gas from this last process is necessarily of too low a B.Th.U. quality to distribute economically in our present distribution systems.

In studying the basic physical and chemical laws governing the phenomena of carbonization, it would appear that a fourth distinct and fundamental process is possible, whereby the low-volatile close-grained coke of the coke oven may be retained, the 23 gallons of low-temperature and complete gasification oil, and also a yield of 8000 c.ft. of 700 B.Th.U. gas. This gas yield, it would appear, can be obtained by adding to 4000 c.ft. of low-temperature gas the gas from the high-volatile coke of the low-temperature residue.

We have devised two pieces of crude apparatus to show how a fourth fundamental process can be applied to the carbonization of coking coal. From the experiments with this apparatus, we have deduced the following five basic laws governing carbonization:

1.—If removal of volatile matter from coking coal were the only consideration, the high heats commonly used in carbonization are unnecessary.

2.—The condensable hydrocarbons of coal are more valuable as raw products the nearer to their primary state they exist, because no way has been found to convert any but a meagre portion of them into permanent gas.

3.—The less the cracking, and the more the distillation of condensable hydrocarbons occurs, the less will be the intensity of heat required to drive off the volatile matter.

4.—The less the heat through which the gases from the non-condensable hydrocarbons must pass in leaving the retort, the richer will be the gases and the greater the B.Th.U.-feet from this source per unit of coal.

5.—The closer the ideals of No. 4 are met, the greater will be the possible cubic feet of mixed gas of a determined calorific value per unit of coal.

1. *If the removal of volatile matter from coking coal were the only consideration, the high heats commonly used in carbonization are unnecessary.*

To bring this fact clearly before the eye, low-temperature oils from a given coal were collected, having a boiling-point range from 660° to 750° Fahr. These temperatures were selected because R. V. Wheeler and M. J. Burgess have drawn the following conclusions from their experiments on the low-temperature distillation of gas coal:

That liquids other than water begin to distil over as a reddish brown oil at 600° Fahr., but inasmuch as its appearance is unaccompanied by any marked evolution of gas, it is liquidated out of the coal conglomerate rather than as a decomposition product of the coal substance.

That a critical decomposition point is reached at about 660° Fahr., which is marked by a rapid increase in the gas evolution and the appearance of much viscous oil.

With these 660° to 750° oils at hand, some interesting physical experiments suggest themselves to the curious-minded. These oils were placed in a glass distilling flask, in the neck of which was suspended a fly-screen wire basket, containing some 12 grams of coal. As these oils were made to distil slowly over, the coal was naturally caused to rise slowly through a pre-determined temperature range (660° to 750°), and further to do so in an intensified atmosphere of the same liquid and vapour hydrocarbons as were present when these oils were driven from the retort. Thus it was possible to study under glass this critical decomposition point (660°), where all the physical characteristics could be observed by the eye.

Gas coal treated in this way suddenly commences at 660° to come out through the wire meshes, and to drop off slowly in bubbling mats into the boiling oil. At the same time, the condensing oils themselves assume a dirty-brown colour. This phenomenon continues with rising temperatures, until the oils are distilled over. The gas evolution becomes more and more pronounced. Some vapours evolved at this time settle towards the oil surface, which is not surprising, when you consider that ethane has a specific gravity of 1·038. The residue in the basket was found to be a dryish, greasy, graphite-like substance, possessing no coking characteristics, but rich in gas-making constituents. The oils, containing the wash from the coal, when carried to oil coke, left a residue rich in gas, and possessing considerable coke-forming constituents. A tremendous amount of lamp black was formed in burning any of these gas-making constituents.

We next built a tar still 5 in. diameter and 20 in. high, the top of which took the same lid and glass distilling apparatus as an ordinary tar still. The sides were thoroughly insulated, except the first 7 in. from the bottom. A fly-screen cone-shaped basket, provided with a ½-in. tube up through its centre, was made. Suspended from the bottom of this was a tin boat. 600 c.c. of 660° to 750° oil were placed in the bottom of the still, and 180 grams of coal were placed in the basket.

Two tests were run with this apparatus. In each case the coal was screened through ⅜ in. mesh, and remained on the fly screen which formed the basket used in this test. In the first test, as soon as a steady distillation was established (30 c.c. of oil and water), the charge was pulled; we wished to look at the coal and determine the amount of oil it had absorbed. The coal was entirely softened. The lumps had disappeared into a conglomerate tarry mass, which could be stirred when hot. The coal had absorbed 85 c.c. of oil. In the second test, distillation was continued until 200 c.c. of oil had come over. It was found that the 200 c.c. of oil had refluxed and come over before 650° was reached. On re-distillation in a glass flask, 100 c.c. came over under 650°, while 80 c.c. came over above 650°, leaving a 20 c.c. equivalent residue in the flask and for distillation loss. The coal in the basket had shrunk to less than half the original volume and weight. The boat (which was empty at the start) was full; its capacity being 175 c.c. of oils. Those oils on top distilled at 670°, while in the bottom of the boat was a thick sediment of viscous oil, resembling pitch, which had melted and run down from the coal. In the bottom of the still were 300 c.c. of heavy black tar. From the boiling point of the oil in the boat, it is apparent that, up to the conclusion of the test, no heat above 670° had been applied to the coal.

The residue, both in the basket and in the boat, contained much volatile matter—practically all non-condensable. To remove this volatile matter, and to get some idea of the intensity of the heat required to drive it off, a piece of sheet tin was heated to a very dull red over a bunsen burner. About ⅛ in. above this sheet, which was large enough to avoid danger of igniting the gases, was a piece of fly screen. On this screen were placed the two samples of residue. The gas evolution was rapid; the pieces of coal residue retaining their original cold colour until the gas had been driven off. Thereupon they instantly came to a glow—a particle here and a particle there, according to which particle was first freed from its volatile. In neither residue were there any signs of condensable vapours or lampblack. This heat was not above 1050° Fahr., and was capable of taking the entire residue to carbon and ash.

Before leaving these tests, it might not be amiss to describe another phase of carbonization studied with this type of apparatus. Certain low-temperature oils below the 660° boiling point contain upwards of 30 p.ct. of tar acids. These acids (boiling point up to 450°) were separated from the oil in the usual way, and placed in a glass distilling flask provided with a wire basket as in the previous test. As these acids were caused to distil slowly over, the coal became thoroughly washed with the acids of each boiling point. As long as oxygen was present, these acids kept washing out from the coal a dirty-brown substance. As often as the distillation was stopped, and air could reach the basket, the restarting of distillation caused a further washing. When a small stream of oxygen was introduced into the space above the boiling acids, the wash flow was continuous. At no time up to four hours did the washing cease. These acids taken to coke left a residue which, when heated in a crucible, puffed up into a "hornet's nest." The coke structure of the remaining coal was materially improved by this washing. This frothing residue added to ordinary boiler coal produced a very fine coke formation in the crucible test. This test opens a line of thought as to the influence of the high oxygen content of Illinois coals on their coke formation.

We therefore come to the conclusion that, at a temperature under 700° Fahr., coal can be completely softened and its coking properties disappear. Under certain conditions, a heat under 1050° Fahr. can drive off practically all of the volatile matter from coal.

2.—*The condensable hydrocarbons of coal are more valuable as raw products the nearer to their primary state they exist, because no way has been found of converting any but a meagre portion of them into gas.*

The primary tars from coal are largely high boiling point oils. The lighter constituents we usually associate with coal-tar products are products of later decomposition, which have left behind free carbon as well as still higher vaporization point residues. Once these primary oils are separated from the coal in the primary stage, they can be more accurately controlled for further splitting-up into products that may be desired in special apparatus designed for this purpose than in any high-temperature carbonizing process known. In low-temperature coal distillation or its equivalent, there is obtained at least twice the tar yield that high temperature gives. The nearer the primary stage the oils are

obtained, the higher the proportion and content of tar acids, creosoting oils, anthracene, &c., will be before pitch of a desired quality is obtained. In our experiments, we have produced from the same coal, by varying the temperatures of carbonization and the retort atmosphere, tars distilling 97 p.ct. oil and 3 p.ct. oil coke, down to tars distilling 30 p.ct. oil and 70 p.ct. coke.

Let us take a fair tar sample—79 p.ct. oil and 21 p.ct. oil coke. Distillation of this particular oil showed that it was possible to distil 50 p.ct. as oil and leave a remainder of 145° Fahr. melting-point pitch. Two samples of this 50 p.ct. oil were saved—one sample as distilled over, and one sample washed free from its tar acids. These samples were cracked in a gas oil testing machine at 1500° Fahr. in an atmosphere of blue gas, with the following results:

At 1500°.	Without Tar Acids.	Including Tar Acids.
Oil per 1000 c.ft.	2·90	2·91
B.Th.U. mixed gas	406	416
Oil gas per gallon	37·2	46
P.ct. to tar	16·4	21·8

Tar.	Much Naphthalene.	Odour Naphthalene.
B.Th.U. oil gas	1,360	1,230
B.Th.U. feet per gallon	50,700	56,600
H_2SO_4 absorbs from oil	70 p.ct.	—

The question has been repeatedly raised as to how much the possible gas yield has been robbed in obtaining the less degraded tars and oils in the various low-temperature processes. We can make some approximation from these results, if we may assume that these products, sent through the 1500° atmosphere of hydrogen, or their equivalent, were all existent at some time in the ordinary high-temperature retort, and most of them passed through a temperature range up to and beyond 1500°. They probably could not contribute much more to the final high-temperature gas and tar than they did to the blue gas.

Roughly 10 gallons of oil—83 lbs.—give:

Lbs.	P.Ct.
18·0 tar	22·0
32·0 gas	38·0
33·0 carbon, &c.	40·0
83·0	100·0

or possibly 1000 c.ft. of 566 B.Th.U. gas.

This result—1000 c.ft. of 566 B.Th.U. gas—tallies closely with the conclusion of most investigators as to the contribution of tars to high-temperature gas yields. Therefore, obviously, it is far from economical to ruin 83 lbs. of low-temperature oils for 1000 c.ft. of 566 B.Th.U. gas equivalent. There must be some way to save low-temperature oils, and at the same time drive off the rich volatile matter remaining in the coke.

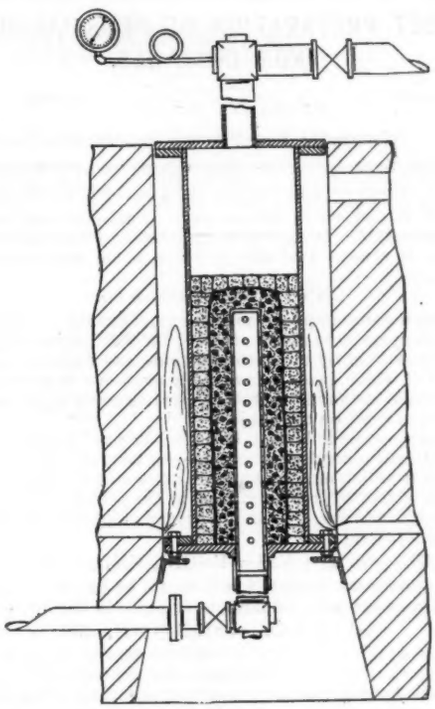
3.—*The less the cracking and the more the distillation of condensable hydrocarbons occurs, the less will be the intensity of the heat required to drive off the volatile matter from the coal.*

In view of the tar-still tests, and to carry on the study of the intensity of heat required to drive off volatile matter from coal under various conditions, and to investigate the physical characteristics of the gas, tar, and coke, a very simple carbonizing apparatus was designed. This is diagrammatically shown.

In the carbonization of coal in an oven, there is formed a plastic film between the coke already formed and the uncarbonized coal. Its temperature must be between 660° and 750°—say, 750°. As heat is applied through the inside wall of the retort, this film progresses inwardly towards the centre of the charge. The film may at times interpose a resistance of as high as 30 in. to 40 in. (water) to the flow of gas and vapours.

This carbonizing apparatus is of such design as to cause the film to form an inverted bell, in the centre of which is placed a vented duct. The outlet from this duct is led from the bottom, so as to be protected from the action of any external heat. Through this outlet the inwardly travelling heat drives off the oils and vapours borne up to this 750° temperature, as well as such gases as find their easiest egress by this path of travel. The residue of this plastic film is simultaneously carbonized at some higher temperature. A top retort offtake provides a means of collecting and removing such of these gases and vapours as find their easiest egress through this path. Suitable exhausting and scrubbing means must be provided to take care of the gas.

It is apparent that this apparatus gives us a means of studying the influence of distillation and cracking on the intensity of heat required and the final mode of existence of the products. If the top outlet be closed, and a slight exhaust suction be maintained in the inner duct, pressure readings under the top lid will give some idea of the resistance to flow of the plastic film. At times this rose to 12 in. mercury. Instead of bringing coal through a varying range of temperatures, we passed a varying range of temperatures through a stationary charge of coal. By establishing the proper pressure balance between the top and bottom outlets, we could recover practically a full yield of low-temperature oils, and drive off the volatile matter from the remainder at any temperature desired from 1000° Fahr. up. This lower possible temperature range was available because little heat was employed



in uselessly cracking the low-temperature oils and re-vaporizing the heavy residues therefrom. We could throttle the bottom outlet, and leave the top outlet open. This enabled us to approach high-temperature retort practice. A comparison of the carbonizing time with the same intensity of heat—with and without cracking—indicated how unnecessary are the high heats used in ordinary carbonizing practice. In every test where excessive cracking was avoided, the time of carbonization was cut almost in half.

(To be concluded.)

Brazed Joints for Cast-Iron Mains.

Messrs. A. F. Bridge and M. R. Thompson, of the Southern Counties Gas Company, Los Angeles, describe, with a number of photographs, in the "Gas Age-Record" [Dec. 8], a method of jointing for cast-iron gas-mains which they feel possesses many advantages. In Southern California, the laying of cast-iron mains has been almost entirely discontinued within recent years, despite the fact that in much of the area served soil conditions are adverse to steel; and one of the causes of this abandonment is said to be the apparent impossibility, with methods hitherto available, of obtaining a joint which will remain tight while conveying high-pressure gas. A joint has, however, now been developed by them which the authors believe meets the requirements, and which is simple, while involving well-established principles. This joint is the result of considerable experiment. In the first place, it was found that 4 in. was the largest size of main that could be jointed by welding without pre-heating and annealing (which would make the joint prohibitively costly). Brazing was then attempted, using copper and bronze rods; and this turned out to be an unqualified success for all sizes of pipe when Tobin bronze was employed. The joint finally adopted was a bronze collar about 1½ in. wide by 0·2 in. thick; the pipe being cut off square and butted. The effect of tension or bending applied to the pipe is to produce a shearing stress at the surface of contact between bronze and iron, and parallel to same. The resistance of the joint in shear was ascertained to be upwards of 20,000 lbs. per sq. in. The central portion of the bronze collar is subject to tension, but the ultimate strength of this material is 80,000 lbs. per sq. in. Convinced by preliminary experiments of the practicability of this joint, about 2100 ft. of 8-in. cast-iron main with brazed joints was laid last spring, and no difficulties of any kind were encountered. Connections were also made with other mains, both steel and cast-iron, by the brazing process. Standard oxy-acetylene welding equipment was employed, and the actual making of the joint presented no difficulty. Precautions should, however, be taken to prevent the operator inhaling zinc-oxide fumes given off by the molten bronze. A flux is used in making the joint; one which was quite successful having the following approximate composition by weight: Boric acid, 16 parts; potassium chlorate, 4 parts; iron carbonate, 3 parts; and granulated yellow brass spelter, 32 parts.

London and Southern District Junior Gas Association.—The next business meeting of the Association takes place on Friday evening, the 25th inst., at the Westminster Technical Institute, when Mr. H. J. Escreet, B.Sc., Assistant Distributing Engineer to the Gas Light and Coke Company, will read a paper on "The Use of Pneumatic Tools in Re-making Lead Joints."

DIRECT PREPARATION OF PRUSSIAN BLUE FROM COAL GAS.

By ACHILLE DELCLÈVE.

[Translated from "Chimie et Industrie."]

Cyanogen is present in the gas resulting from the carbonization of coal in retorts or coke-ovens; but Lewis has shown that in the gas itself it can only exist in two forms—uncombined or as hydrocyanic acid. It cannot be present as thiocyanic acid, for hydrogen is always available to bring about the following reaction:

$$CNSH + H_2 = HCN + H_2S.$$

Further, it cannot appear as ammonium cyanide, which decomposes at temperatures above 266° C.; indeed, hydrocyanic acid is always thrown out by the carbon dioxide and hydrogen sulphide, an excess of which gases is invariably available to combine with the ammonia. Ammonium thiocyanate has never appeared in any experimental work on the subject.

Cyanogen compounds may be found in gas liquors; but they are the result of secondary reactions—for instance, the ammonium ferrocyanide which may be found in ammoniacal liquor is due to the action of free hydrocyanic acid, in the presence of ammonia, on iron sulphide formed by the hydrogen sulphide acting on pipes and scrubbers—thus:

$$6HCN + 6NH_3 + FeS = Fe(CN)_6(NH_4)_4 + (NH_4)_2S.$$

Any ammonium thiocyanate found would be due to the action of carbon bisulphide with ammonium sulphide in the liquor, thus:

$$(NH_4)_2S + CS_2 = 2H_2S + NH_4CNS.$$

Now free cyanogen is very unlikely to survive in proximity to the various constituents of coal gas; and consequently one is left to deal with hydrocyanic acid as the only serious competitor.

Hydrocyanic acid is one of a family of important compounds. The world's annual consumption of alkaline cyanides amounts to nearly 20,000 tonnes; their use having given new life to the gold refining industry. The ferrocyanides are in demand for dyeing and chemical works, and in metallurgy. Prussian blue itself is needed in the leather, paper, and colour industries; but the demand for it would undoubtedly increase greatly if its price were brought to a more economic level. The value of the above-mentioned products justifies their synthetic preparation; but practice and research in France have hitherto fallen behind that carried out in England and Germany—this despite the fact that the presence of hydrocyanic acid is a great nuisance in town gas, resulting as it does in stable compounds being formed in, and impairing the efficiency of, oxide purifiers.

The foregoing considerations have led to the making of numerous efforts to remove the hydrocyanic acid; but disappointment has frequently resulted not only from the irregularity and impurity of the products obtained, and their low commercial value, but from the high expenditure entailed in working-up the liquor. A perfected process not only depends on a combination of accurate chemical, physical, and mechanical conditions, but demands the greatest skill and care in operation. The various methods suggested from time to time have been superseded by the Bueb process, which leaves for treatment a complex of iron, cyanogen, and ammonia compounds in a paste. After elimination of the ammonia, filtration, and drying, one has as the final product a low-value material containing, according to the patentee himself, 30 p.ct. of Prussian blue, 44 p.ct. of ammonium ferrocyanide, and 4 p.ct. of ammonium sulphate. The abandonment of processes for the straightforward extraction of hydrocyanic acid, in favour of the preparation of alkaline ferrocyanides, is due in great measure to the high cost of working-up the large bulk of liquor, and to the unavoidable substitution of low-value thiocyanates for some of the acid.

Apart from the intrinsic value of cyanogen compounds, their elimination from the gas before its passage through the purifiers should be practised in every works, for their removal from the oxide means the treatment of a large mass for the recovery of only a very small total percentage.

A NEW METHOD.

The author suggests a process for the treatment of coal gas which will result in the direct preparation of refined commercial Prussian blue, and which was the outcome of close study of the complex reactions that take place when the gas is passed through aqueous solutions of selected ferrous and alkaline salts; the more promising reactions being encouraged, with purity and commercial value as the object in view.

THE REACTIONS CONCERNED.

When an alkaline solution and one of a ferrous salt are mixed together, a precipitate of ferrous hydroxide is produced:

$$2MOH + FeSO_4 = M_2SO_4 + Fe(OH)_2 \quad . \quad . \quad . \quad . \quad . \quad (1)$$

If coal gas is bubbled through an alkaline solution in which ferrous hydroxide is suspended, iron sulphide results, thus:

$$Fe(OH)_2 + H_2S = FeS + 2H_2O \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

The iron sulphide in suspension in alkaline solution, in the presence of hydrocyanic acid in the gas, recombines to form the corresponding alkaline ferrocyanide:

$$FeS + 6HCN + 4MOH = Fe(CN)_6M_4 + H_2S + 4H_2O \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

At the same time, however, secondary reactions take place, which are far from negligible:

$$2MOH + H_2S = M_2S + 2H_2O \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

$$MOH + HCN + H_2S = CNSM + H_2O + H_2 \quad . \quad . \quad (5)$$

It is seen that part of the hydrocyanic acid is transmuted into thiocyanate, which represents depreciation, while the liquor becomes a carrier of sulphur compounds which on oxidation produce a series of unstable polysulphides, hyposulphites, &c.

The coal gas is never innocent of free oxygen, due to slight defects in the plant; and this oxygen encourages the deposition of free sulphur, thus:

$$H_2S + O = H_2O + S \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (6)$$

$$H_2S + 2\,Fe(OH)_2 + O_2 = Fe_2 + (OH)_6 + S \quad . \quad . \quad . \quad (7)$$

This moist uncombined sulphur reacts with the sulphide of iron to form various polysulphides more and more rich in sulphur and on which the hydrocyanic acid has no further action; the hydrocyanic acid working according to reaction (9):

$$2FeS + S = Fe_2S_3 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (8)$$

$$Fe_2S_3 + HCN = CNSH + 2FeS \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (9)$$

$$Fe_2S_3 + FeS = Fe_3S_4 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (10)$$

$$Fe_3S_4 + S_2 = 3FeS_2. \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (11)$$

SUPPRESSING THE SECONDARY REACTIONS.

In order to obviate as far as possible these "parasitic" reactions, two courses are open: (1) In place of a caustic alkali, to employ a weak acid salt; the latter being replaced by the hydroferrocyanic acid which develops in the liquor, while the hydrogen sulphide is debarred from an alkaline grouping. Sodium carbonate fulfils such conditions. (2) To guard to the utmost against leakage of air into the gas, thus eliminating the factor which causes deposition of free sulphur. Without doubt the most troublesome impurities which occur in bye-product cyanogen compounds have sulphur as their base; and sulphur is freed by the following reactions in a vicious circle:

$$Fe_2S_3 + 2H_2SO_4 = 2FeSO_4 + 2H_2S + S \quad . \quad . \quad . \quad . \quad (12)$$

$$FeS_2 + H_2SO_4 = FeSO_4 + H_2S + S \quad . \quad . \quad . \quad . \quad . \quad (13)$$

METHODS EMPLOYED.

Accordingly, attention was devoted to devising means for avoiding an accumulation of free or combined sulphur in the reagent and for preventing the formation of sulphocyanides; and the following points were borne in mind:

1.—Ferrous salts in solution, if treated with the solution of an alkaline carbonate, give first an insoluble ferrous carbonate. The latter is unstable in water, and becomes ferrous hydroxide. Reaction (2) thus takes place, followed by (3) with the production of alkaline ferrocyanide.

2.—The gas should be free from ammonia, in view of the harmful effect of both caustic alkalis and alkaline sulphides.

3.—Raising the temperature encourages the reaction

$$Na_4Fe(CN)_6 + 3S_2 = 4NaCNS + Fe(CNS)_2,$$

which generates but little heat, and proceeds very slowly at low temperature. The process should, accordingly, be carried out at the ordinary temperature.

4.—In view of the fact that free or combined oxygen encourages the deposition of sulphur, care should be taken that ferric salts are absent from the ferrous salts employed.

Bearing in mind the above conditions, the process develops as follows. The gas is bubbled through the alkaline ferrous mixture until the latter is saturated with the hydrocyanic acid. One is then left with a cyanide mud composed of alkaline carbonate, alkaline ferrocyanide, sulphate (remaining from the first reaction), and a little thiocyanate which is bound to form in spite of precautions. The solution also suspends rich iron sulphides, on which the hydrocyanic acid has no further action; these being derived, as pointed out above, from the unavoidable presence of some uncombined oxygen.

REMOVAL OF THE IRON SULPHIDES.

The separation of these iron sulphides from the ferrocyanide solution involves care, as there is the risk of leaving some sulphur as unstable hyposulphites and sulphites. Accordingly it is desirable to get them into a steadier combination; and oxidation by means of agitation with air will effect this. The sulphides are decomposed, with the formation of ferric oxide and sulphur; while the hydrogen sulphide which was taken into solution during the process is oxidized to sulphuric acid, reacting to alkaline sulphate.

$$2FeS + 3O + 3H_2O = Fe_2(OH)_6 + 2S.$$

$$Fe_2S_3 + 3O + 3H_2O = Fe_2(OH)_6 + 3S.$$

$$H_2S + 2O_2 + Na_2CO_3 = Na_2SO_4 + H_2O + CO_2.$$

$$Na_2S + 2O_2 + Na_2CO_3 = Na_2SO_4 + Na_2CO_3.$$

This operation concluded, it is easy to separate the precipitate of ferric oxide and sulphur from the solution; and then the ferrocyanide is readily precipitated from the latter in the form of insoluble ferric ferrocyanide (Prussian blue), the regulation of quality being simply a matter of manipulation. The precipitate of ferric oxide and sulphur is treated with dilute sulphuric acid, with the production of sulphur (which is filtered out) and a solution of ferric sulphate which is used for the oxidation of the ferrous ferrocyanide to the Prussian blue.

ADVANTAGES OF THE PROCESS.

Thus, by simple means, the suggested process permits:

1.—Recovery of the whole of the hydrocyanic acid.

2.—Elimination of the formation in the purifiers of compounds inert as far as sulphuretted hydrogen is concerned.

3.—The manufacture of commercial Prussian blue, with a very small quantity of sulphur (which proportionately eases the duty of the purifiers) and with sufficient ferric sulphate to complete the working-up of the blue.

4.—The avoidance of low-value thiocyanates which necessitate supplementary treatment.

The author claims that of all processes for preparing Prussian blue it is undoubtedly the most economical. Further, very little apparatus is called for—a three-compartment rotary scrubber, bubbling vats, two (possibly one) Zenith filters, a drier, and a few pumps form the essential features of the plant. As mentioned above, the gas treated must be free of ammonia; and works employing the semi-direct method of sulphate preparation are especially well equipped for adopting the process. It is pointed out that sulphuric acid of strength 12 to 15 gr. to the litre will have no effect on the HCN content.

M. Delclève in conclusion remarks on Prussian blue manufacture from the national point of view, saying that at present France is largely dependent on other countries for the derivatives of cyanogen which are required by her industries. Prussian blue may form the starting-point for a number of synthetic operations, and is closely associated not only with the great undertakings of peace-time but with the "Défence Nationale."

Meter Collecting Novelty.

Messrs. George Glover & Co. have recently put on the road a novel motor van, the body of which takes the shape of a large dry gas-meter. It is lettered in white on a red ground, and was built entirely at the firm's Chelsea works. As is well known, Messrs. George Glover have for many years made a speciality of the manufacture of large dry meters, and this van serves the double purpose of a striking advertisement and a roomy vehicle for delivery and collection of meters at customers' works.

Improving the Gas Service to Linotype Machines.

Mr. T. M. Foulk, of Denver, contributes a "wrinkle" to the "American Gas Journal," in the shape of a gas service pipe filter for use in connection with linotype machines; the idea being to eliminate trouble which has been experienced owing to regulator valves failing to act properly. He explains that the regulator is located in the hot zone of the machine, and hydrocarbons, rust particles, and other impurities in the gas are apt to carbonize on the base of the regulator valve, causing it to stick in one position. By introducing ahead of the regulator the catch-pot or filter indicated by him, practically 90 p.ct. of this trouble has been eliminated. The filter is made up of a piece of 8 in. pipe 14½ in. long, having a cap on one end and an 8 in. by 13½ in. flange and blind flange on the other. The flanged end is made the inlet end, and is easily opened for inspection or refilling. In filling the filter, a spacer made from a bar of steel 2 in. wide and ⅛ in. thick, bent into a circle 8 in. in diameter, is inserted at the outlet or capped end. Next to this spacer is placed a circular wire screen of six mesh 0·035 wire, 8 in. in diameter. Then alternate layers of No. 00 steel wool and ordinary cotton batting are placed until the centre is reached. Here another spacer with screens on each side is inserted, and then the alternate layers of steel wool and cotton are continued until the inlet or flanged end is reached. Another screen and spacer are placed here, and a blind flange, with gasket in place, is bolted on, and the filter is ready.

Water-Gas Tar Emulsion.

The difficulty which has frequently been experienced in connection with water-gas plants in separating the tar from the water condensed from the gas is referred to in Technical Paper No. 304 of the United States Bureau of Mines, Washington. Mr. W. W. Odell, by whom the paper has been prepared, remarks that in the production of carburetted water gas the conversion of the oil used into a fixed gas is never absolutely complete, because appreciable amounts of carbon and of condensable tarry matters always form. Owing to variations in operating conditions, oil used, gas standard, &c., this tar is not uniform in character and quality. It may contain a large or a small percentage of light oils, and little or much free carbon and naphthalene. A water-gas tar emulsion is tar having in suspension small droplets of water which do not readily separate from the tar; and the proportion of water that can be thus retained may be as high as 85 p.ct. Usually one does not refer to a tar as an emulsion when its water content is as low as from 1 to 5 p.ct. The consistency of the emulsion depends, other things being equal, upon the percentage of water dispersed in the tar; the greater the percentage of water present, the more viscous the emulsion. At ordinary room temperature, an emulsion containing 70 to 75 p.ct. of water is generally thick and buttery, while one with 2 p.ct. of water is approximately as fluid as a water-free tar. The size of the droplets of dispersed water is not the same in all tar emulsions or in any particular one; but, other things being equal, the most obstinate emulsions—*i.e.*, those having a high water content, and not settling readily—contain droplets of smaller average size than the less permanent emulsions.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Mr. Plant's Yorkshire Junior Association Paper.

SIR,—I would esteem it a favour if you would allow me to make a few remarks upon the paper read by Mr. A. Y. Plant before the Yorkshire Junior Gas Association on Dec. 15, and reported in the "JOURNAL" for Dec. 26, 1923.

In the test results set forth, remarkable coke production figures with steaming were obtained:

Gross 14·88 cwt. per ton of coal . .
Net for sale 11·75 cwt. per ton of coal } Steaming; calorific value of gas 433 B.Th.U.

Calculating from the stated analysis of the coal and coke, the theoretical coke production would be:

Gross 12·92 cwt. per ton of coal carbonized . . . .
Net for sale 9·79 cwt. ,, ,, ,, ... } Without steaming.

These calculated figures would be considerably reduced when steaming to the extent necessary to obtain a 433 B.Th.U. gas; this is emphasized by a study of the ash figures in coal and coke:

Coal, dry basis . . . . . 3·63 p.ct.
Coke, ,, ,, ... 8·62 p.ct.

The theoretical ash content in the coke without steaming would be 5·42 p.ct. It is possible that the coke figures obtained are not truly representative, or that the coal analysis was made upon a faulty sample.

With regard to the ash content of vertical coke, the author made a decided misstatement in that the content was lower than that of the coke obtained by horizontal practice.

S. CHEESEMAN.

33, *Thorpe Road, Forest Gate, E., Jan.* 5, 1924.

Tully Gas Analysis.

SIR,—Mr. Tully is solely responsible for the fact that information as to results from his plant had to be obtained from an independent source.

I have nothing further to add to this correspondence, but should be glad, in view of the last paragraph of Mr. Tully's letter, if you would kindly print the enclosed copy of the letter which I addressed to Messrs. Tully Gas Plants, Ltd., in August last.

Gas Company, Davygate, York, Jan. 3, 1924.

H. E. BLOOR, Engineer.

[ENCLOSURE.]

Messrs. Tully Gas Plants, Ltd.
47, Victoria Street, S.W. 1.

DEAR SIRS,—At the request of the President of the Institution of Gas Engineers, I am preparing a paper on "The Quality and Composition of Town's Gas," to be presented to the Public Works, Roads, and Transport Congress in November.

I desire to include in my paper a set of typical analyses of town's gas, and should be greatly obliged if you would kindly furnish me with such an analysis of Tully gas, with the observed calorific power of the gas at the time of testing.

Thanking you in anticipation,

Yours faithfully,
(Signed) H. E. BLOOR,
Engineer, York Gas Company.

Removing Organic Sulphur from Gas.

SIR,—Referring to the article in your issue of the 26th ult., under the heading "Removing Organic Sulphur from Gas," it would be interesting to know when the system of hot purification for the removal of CS_2, used by the Portland (Oregon) Gas and Coke Company, was inaugurated.

In a paper on "Sulphur Purification," read by me before the London and Southern District Junior Gas Association, at their meeting on March 25, 1904 (extracts from which were published in the "GAS JOURNAL" and other technical papers), I suggested breaking up CS_2 by passing the gas through a heated duct, in which water gas was being generated, to allow the nascent hydrogen to attack the CS_2 molecule, forming H_2S and setting the carbon free—

$$CS_2 + 2H_2 = 2H_2S + C.$$

As the resulting carbon would be immediately oxidized, the above reaction does not fully describe what occurs; but it is sufficient to indicate the principle. Undoubtedly, the carbon and water vapour present would each play its part.

$$CS_2 + 4C + 4H_2O = 2H_2S + CH_4 + 4CO.$$

As the publication synchronized with the suspension of the Sulphur Clauses, the *raison d'être* of the process became non-existent, and it was dropped.

Now, while I fully recognize and admire the ingenuity and *nous* of the Americans as a nation, I submit that, if a process were published in England in 1904, the use of that process in America, at a later date, cannot be regarded as original.

Render unto Britain the things that are Britain's.

OLIVER W. DOUGAN.

65, *St. Ann's Hill, Wandsworth, S.W.* 18, *Jan.* 7, 1924.

Calorific Value of Gas at Ramsbottom.

SIR,—I notice on p. 45 of the last issue of the "JOURNAL" a paragraph stating that the average quality of gas supplied by this Company was 457·84 B.Th.U. per c.ft.

I should be obliged if you would correct the figure to 482·84 B.Th.U. per c.ft., which is the average result of our testings for the last quarter.

p.p. Ramsbottom Gas Company,
JOHN E. SUTTON, Manager.

Ramsbottom, Jan. 3, 1924.

Pulverized Fuel for Boiler Firing.

SIR,—I am extremely obliged for the notice and Editorial comment concerning my paper "Pulverized Fuel and Efficient Steam Generation" given in your issue of the 2nd inst. I think, however, that your statement—"Naturally the object is to encourage consideration of the use of pulverized fuel; and the system advanced by Mr. Brownlie is the 'Lopulco.' The paper ignores other pulverized fuel methods; in it the 'Lopulco' is the one and only"—is hardly a correct view of the paper. The object is to get British engineers to consider seriously the extraordinary progress in the use of pulverized fuel for steam generation now taking place in the United States; and, judging by some of the arguments advanced against the paper by a number of people, it is high time some of the elementary facts were more generally known.

I have not "advanced" the "Lopulco" system. The reason why I have given the detailed performance figures relating to it is simply because no other system, at any rate to my knowledge, has available figures of anything like equal importance from the point of view of size of boilers, magnitude of boiler plant, and especially detailed continuous records of performance for months on end. If similar information for other systems is available, where is it? I may also point out that the figures I have used have not been supplied to me by the "Lopulco" people, but are those of Mr. John Anderson, the Chief Engineer of the Milwaukee Electric Light and Power Company, whose Lakeside station, running entirely on pulverized coal, is the most efficient in the world; the records being open to everybody. The coal used is not high grade, and the idea that pulverized coal is not so flexible as mechanical stoking from the point of view of quality of fuel burnt at high efficiency is exactly the reverse of the truth—one of the great advantages of burning fuel in a pulverized condition being this increased flexibility. For example, the huge new Cahokia station at St. Louis, to be fired entirely by the "Lopulco" system, and of which 60,000 KW. has just started up, is using low-grade Illinois (Belleville) coal of 10,500 B.Th.U. per lb., and containing 5 p.ct. of sulphur.

Gas coke will burn perfectly on these lines, either alone or mixed with coal, oil, or any gaseous fuels, as proved by the Ford River Rouge plant, at Dearborn, Detroit. Possibly you may be right about British power-station engineers regarding with amiable interest the experiments of others; if so it is a very sorry attitude to adopt. It was not so very long ago that British engineers led the world both in originality and initiative, and left others to follow.

Also, I would point out that there are no boilers in the world showing as high efficiency with solid fuel firing as with pulverized coal. Lakeside is running all the year round at 85 to 86 p.ct. efficiency. The newer plants are guaranteed up to 88 p.ct., and no solid fuel plant is running at 80 p.ct., though 81 to 82 p.ct. has been mentioned for the new Barton station at Manchester. Pulverized fuel has also, of course, as detailed in the paper, many advantages in addition to that of efficiency.

DAVID BROWNLIE.

46, *Grange Road, Ealing, London, W. 5. Jan 7, 1924.*

Gas Explosion in St. Martin's Lane.—Last Monday night a gas-main running underneath the roadway in St. Martin's Lane blew up with a loud report, and several pedestrians are reported to have been injured. A few seconds later another explosion occurred about a hundred yards along the road. In this case the wood paving caught fire, and continued to burn for a considerable time.

Cost of the Belfast Holder.—The saving on wages and materials due to the sliding-scale in the contract of the Belfast Corporation with Messrs. R. & J. Dempster, Ltd., of Manchester, for the erection of the 7 million c.ft. spiral-guided gasholder, the inauguration ceremony in connection with which was reported in the "JOURNAL" for Nov. 21 last, was £15,863 3s. 8d., leaving the actual cost of the holder at £100,544 11s. 11d.

Testing of Gas-Meters at Leeds.—Objection was raised in the Leeds City Council by Dr. Hawkyard to clause 99 of the Leeds Corporation Bill—a clause that had been adopted by a majority of only one vote, and which provides for the transfer from the City Justices to the Gas Department of the power of testing gas-meters. He said it was well that the citizens should have an independent authority to go into this matter. Alderman Sir Charles Wilson, M.P. (the Chairman of the Finance Committee), moving the confirmation of the promotion of the Bill, contended that oversight by the Justices was no longer necessary, and that it was in the public interest that the obsolete arrangement under the Gas Act of 1859 should be abandoned. Alderman G. Ratcliffe (the Vice-Chairman of the Gas Committee) appealed to Sir Charles not to jeopardize the chances of the whole Bill—which would have to face plenty of opposition in any case—by pressing this clause. Eventually Sir Charles agreed to withdraw the clause, while maintaining his opinion that the testing by Justices was farcical and unnecessary. The promotion of the Bill was approved by 56 votes to 1.

A Coal-Breaker Fatality.—A fatal accident occurred at the Halifax Corporation Gas-Works on New Year's Day; James Firth (61) becoming entangled in the machinery of the coal-breaker and elevator—a machine which had been used without accident for 28 years. Evidence was given at the inquest that there was a standing order that no machinery must be oiled while in motion; but in the pit of this machine, where the mangled body of the man was found, an oil can was also discovered. It appeared that he had gone to oil the shafting of the crusher, to reach which he would have to pass a narrow place where the elevator buckets were; and this was against regulations. It was admitted that the deceased appeared to have stopped the crusher; but he must have slipped on the return track of the buckets. Mr. James Hodgson, general foreman, agreed with Mr. Porteus (H.M. Factory Inspector) that the erection of a bar or plate would prevent access to the buckets. In returning a verdict of "Accidental death," the Coroner commended the suggestion that a bar should be placed to prevent people going behind the elevator. Mr. W. H. Bentley, for the Corporation, said the suggestion would receive consideration, and he had little doubt that a bar would be erected

REGISTER OF PATENTS.

Incandescent Gas-Burners.—No. 207,311.

NOBLE, T. R. and E., both of Leytonstone, E. 11.

No. 25,716; Sept. 22, 1922.

This invention relates to incandescent gas-burner fittings of the kind in which a portion of an ordinary mantle is mounted in an apertured carrier detachably arranged on a burner of the non-atmospheric type, so as to provide a light suitable for bathrooms, bedrooms, halls, &c. An object of the invention is to provide a device having improved means whereby the portion of mantle is so arranged that risk of fracture is reduced to the minimum.

A one-piece mantle carrier is curved approximately to the curvature of a portion of an ordinary incandescent gas mantle; and the edges of the carrier are bent over to make grooves which loosely receive the edges of the mantle portion. This carrier is clipped on to the burner tube so that the flame impinges on the concave face of the mantle portion.

Heat Treatment of Carbonaceous Materials. No. 207,623.

NIELSEN, H., of Muswell Hill, and LAING, B., of Hatfield.

No. 23,796; Sept. 1, 1922.

This invention relates to distillation in a revolving retort, the sensible heat of water gas from a separate producer being utilized to effect low-temperature carbonization.

In such a process, the amount of water gas produced per unit of weight of the material gasified in the producer is sufficient, as far as the volume of such water gas is concerned, to effect carbonization of the same unit of weight of raw material in the retort; but in order to carry on distillation to the desired extent, it is desirable to raise the temperature of the water gas above the normal temperature at which the gas generally leaves the producer—namely, from 450° to 550° C.

Accordingly, the present invention provides that the gas produced during the blow period of water-gas making, or a certain proportion thereof, shall be burnt in heaters or regenerators, and the water gas produced during the steaming period passed through the heaters on its way from the producers to the retort; its temperature being raised to any desired extent. Two or more regenerators may be provided for alternate use in connection with two or more water-gas producers; these being necessary to ensure continuous working. The ratio of water gas to blow gas produced is from 1 to 1·25 cub.m. of water gas to 2·3 to 3·0 cub.m. of blow gas per kg. of coal or coke gasified; and by the present process the water gas which normally leaves the gas producer at a temperature of approximately 500° C. may have its temperature increased to 1000° C.—more than adequate to carbonize completely the material undergoing treatment in the retort.

Another feature of the invention is that steam may be produced, or superheated, by the hot coke discharged from the retort into a special chamber for the purpose.

The water gas, having been passed once through the retort, and being thereby highly enriched with gases and oil vapours from the coal, may be circulated again through the regenerators. Thereby it is fixed; and, mixing with the fresh water gas, it again passes through the retort. Complete control of the volume of gases bearing sensible heat, and of the quality of the final product, is thus obtained.

Coke Handling.—No. 207,626.

MEADE, A., of Blackheath.

No. 23,908; Sept. 4, 1922.

This specification describes means for removing coke from gas-works retort-houses; the objects of the invention being to provide an inexpensive and economical telpher apparatus, to remove the coke quickly, and to obviate unpleasant conditions in the retort-house.

Provision is made for discharging the coke through the working floor direct into a skip (or skips) working on a monorail in a subway beneath. Arrangements may be made for partial quenching as soon as the coke passes through. The skip is attached to a cable, which at the end of the subway works over a pair of winding drums, which quickly transport the skip. On the arrival of the latter, the coke is automatically tipped into a quenching pit. The skips are controlled from a cab at the end of the house.

A feature of the invention is the suggested provision of signalling apparatus and a position indicator for the operator. Signalling between the operator and the settings may be by electric lights, corresponding to the settings, located round a circular frame. Within the latter revolves a pointer actuated by gearing on the winding drums, so that the driver knows when the skip is under the setting indicated by a particular lamp.

Gas-Cookers.—No. 207,704.

RADIATION LTD., and YATES, H. J., all of Aston.

No. 33,354; Dec. 6, 1922.

The object of this invention is to provide an improved construction of the body part of gas cookers.

The patentees claim the combination of a cast-iron frame which forms the front of the body and carries the door, and three separate cast-iron base members which, when assembled with the front frame, form a base on which the remaining three sides of the body are supported. On the rear member are ledges which support the side members; and the side and rear members are connected by screws. On the rear member is provided a hood to protect the burner; and with each side member is arranged a detachable bar to carry the drip tin. The burner itself is detachable, being carried by lugs on the rear member.

Manufacture of Combustible Gases.—No. 207,851.

BROADHEAD, C. F., of Clayfield, near Brisbane, BARKER, F. G., and HUNT, P. C. H., both of Melbourne.

No. 23,761; Sept. 1, 1922.

Discussing the manufacture of combustible gases by the combination of a vertical retort super-imposed on a water-gas generator, the patentees point out disadvantages of such treatment as hitherto proposed. They say that there is difficulty in thoroughly carbonizing the charge of coal before its entry into the generator, and in the continuous and satisfactory operation of the plant when caking or bituminous coals are used, as the charge has a tendency to hang up in the retort. Other difficulties met with are that the gases passing upward through the charge travel by certain channels only, and do not percolate readily throughout the charge; in satisfactorily regulating the off-take of gases yielded by distillation of the coal charge during the various periods of operation; that the gases as delivered from the top of the retort carry over hydrocarbons that condense out again, but which could usefully be retained; that the water gas generated on the down runs passes out of the plant without enrichment; and, further, that the checkerwork surrounding the retort is liable to become choked by fusion or by accumulation of dust blown through from the generator.

The object of the present invention is to provide certain improvements in the aforesaid method of operation and in the apparatus therefor whereby the above disadvantages are obviated.

Between the outer walls and the retort is a series of vertical flues; and the stay walls thereof are provided with projections or studs which furnish an increased heating surface without at the same time impeding the flow of the gases. When the flues are constructed thus they are not liable to become choked by fusion of the brickwork or by deposit of dust or other matter. Ports F lead from the top of the generator to the vertical flues; and G, G are suitable air blast inlets from the main D for maintaining combustion of the gas in the flues. The blast connections are coupled together for joint operation by suitable valve gear.

The blast connections are readily adjustable for a regulated supply of secondary air at any one of the required points, access being provided by handholes H at the base of each division. On each side of the top of the generator is arranged a spray J for the delivery of atomized tar, oil, or other fluid under pressure on to the surface of the incandescent coke, the sprays delivering through slots in the brickwork at the lower end of the retort in such positions that they do not interfere with the blast connections G. Atomized tar, &c., is admitted at the top of the vertical flues through sprays K during the periods of gas making either for up runs or down runs. This tar is thus cracked in its passage downwards, thereby enriching the gases either in value or volume, subsequently passing either upwards through the retort during up runs, or downwards through the generator during down runs; any solid residue depositing on the walls or in the flues being consumed during subsequent blast operations.

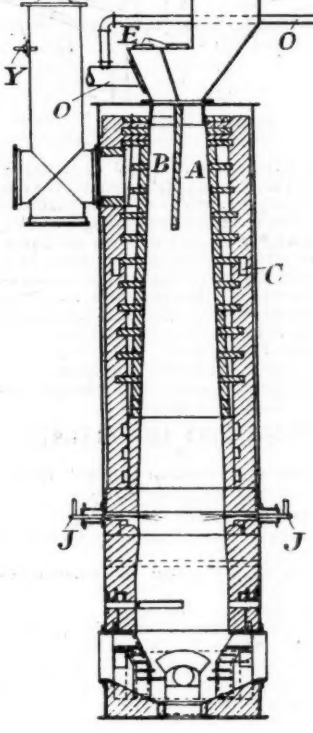


Fig. 1.

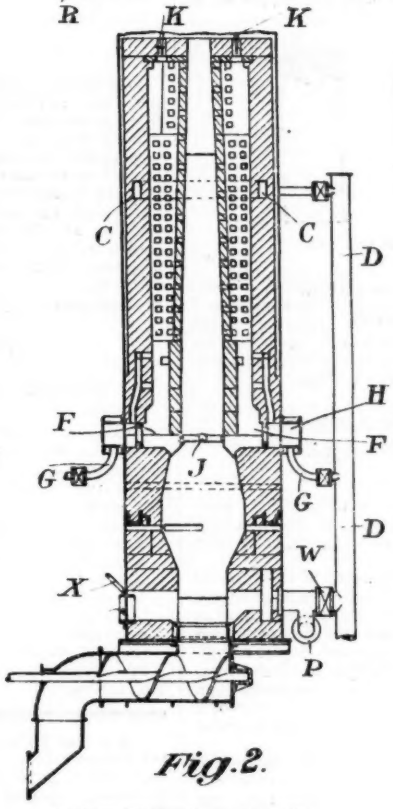


Fig. 2.

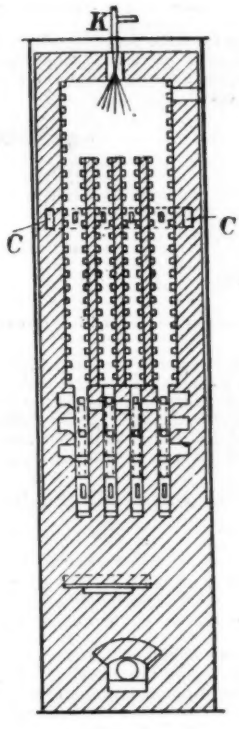


Fig. 3.

A Plant Design from Australia.

Figs. 1 and 2 are vertical sections at right angles of a retort and generator according to the invention; and fig. 3 is a vertical section taken through the heating flues.

The retort is rectangular or elliptical and proportioned so as to give a large heating surface. It is constructed of blocks or bricks bonded together with studded vertical stay walls to the main outside casing, forming vertical flues surrounding the retort. The top of the retort is divided by a curtain plate which is carried down a suitable depth from the top. This curtain plate forms with the side walls two compartments or chambers A and B. The chamber A is of downwardly increasing sectional area and avoids any tendency to hanging up. The lower end of the curtain plate provides a sudden enlargement of cross-section at the bottom of the chamber A, which gives a rolling action to the fuel and serves to open it up for the passage of gas. The compartment B affords a superheating chamber at the top of the retort, for superheating the gas withdrawn therefrom; suitable ports C being arranged in the casing walls to deliver secondary air from the air main D for the combustion of the producer gas for heating up this chamber B.

The retort is provided with a coal feed box and supplementary feed doors E for feeding additional material into the retort when this is required, and for breaking up the fuel within the retort when necessary. When the retort is operated intermittently, it is only partially filled with material; the upper portion being left empty and used as a superheating chamber for the gases.

Further details are next described by the aid of the drawings. Proceeding, the inventors say that in operation air and steam are blown alternately into the generator as is the usual practice in the manufacture of water gas. The steam used may be live steam or exhaust steam from the blowing plant, or may be generated by the waste heat from the gases.

The heat generated by combustion during the blow is partly absorbed by the surface of the retort brickwork and in the flues, and the products of combustion pass off through the stack. When the generator portion of the plant is blown to sufficient heat, the air is shut off from the main D by the valve W, the stack valve is closed, and the steam turned on, at the jet X or at the jet Y for up or down runs respectively. The water gas generated during the up runs passes through the vertical retort; and the heat thereof, together with that available round the retort, causes the coal to be subjected to carbonization, the gases from the retort passing out through the off-take pipe O to the carburettor.

When the valves are opened to change over to a down run, the water gas from the generator, together with any gases produced by the cracking of the tar, &c., sprayed into the flues, passes out through the off-take P to the carburettor. At the same time the gases of distillation from the retort are drawn off by the exhauster R through by-passes and also delivered to the carburettor.

The charge is subjected to graduated temperatures rising towards the generator.

Gas-Making Plant.—No. 207,700.

WOLLASTON, T. R., of Manchester.

No. 32,697; Nov. 30, 1922.

The invention relates to the class of gas producer employing one or more superimposed pre-carbonizing retorts, through which the fuel is passed into the producer, and which form the outlets for the producer gas. Patent No. 113,856 [see "JOURNAL" for April 9, 1918, p. 63] described such a plant, the retorts being "provided with rotating or vibrating means whereby the descending fuel is broken up or opened out."

The object of the present invention is to provide each retort mounted above the producer with a series of compartments down its length, the floorings of which are capable of rotation or movement, and are formed with apertures through which the fuel may fall in a more or less gradual manner from one stage to another. The apertures in the floors are arranged out of line with each other, and ploughs or projecting members are fixed to the shell, by contact with which the fuel will be opened out and eventually compelled to fall through to the floor below, thus making intimate contact with the outgoing gas.

The partitions are fixed to, and rotate with, a central gear-driven shaft.

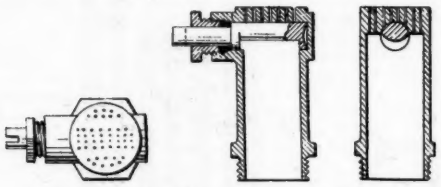
Gas Regulators—No. 207,954.

HOWLETT, M., & CO., LTD., and DOLPHIN, J., both of Birmingham.

No. 28,666; Oct. 21, 1922.

This invention relates to gas regulators for atmospheric lighting or heating burners.

It will be seen from the drawings which we reproduce that the valve is formed by a thick perforated diaphragm closing the supply pipe, working in conjunction with which is a shaped eccentric supported in recesses, and packed.



Gas Regulator—Messrs. Howlett & Co., Ltd.

A feature of the design is the disposition of the perforations. These are arranged in a centre group, which is controlled by the shutter, and two side groups which remain permanently free. Rotation of the shutter will uncover the centre perforations row by row, the maximum passage way being available after the valve has turned through about 120°. Details of construction are clear from the drawings.

Gas Purification.—No. 207,995.

DAVIDSON, W. B., of Newcastle-on-Tyne.

No. 32,317; Nov. 25, 1922.

This invention relates to the purification of a gas by means of catalytic substances, and has for its object to provide means whereby such processes can be carried out more efficiently and economically than heretofore.

According to the invention, the catalyst is supported in the form of a thin film or coating on thin material having a surface as large as possible compared with its thickness, and assembled and supported so as to form a large number of closely disposed surfaces held out of contact with each other. The film-carrying material is made in pieces supported in such a manner as to prevent the closing of adjacent surfaces, so that there will be no production of back pressure in the gas as when granular or powdered material is used, thereby enabling the use of a bed of much greater depth than when granular or powdered material is employed.

The process is described as particularly applicable to the removal of sulphuretted hydrogen from coal gas and subsequent recovery of the sulphur. The catalyst-supporting material is made of thin strip-iron spirals or scrolls arranged to form a bed through which gas can be passed; and these spirals are first coated with a film of rust or oxide by submitting them to the action of moist air or steam and air. This treatment is carried out when the material is supported in position to form a bed; the preheated gas being afterwards passed through the bed, and the issuing gases cooled or otherwise treated to collect the sulphur in any suitable manner.

Gas-Diverting Valves for Purifiers, &c.—No. 208,091.

DEMPSTER, R. & J., LTD., and RODGER, W. F., both of Manchester.

No. 15,582; June 15, 1923.

This invention forms a modification of patent No. 125,040 [see "JOURNAL" for May 6, 1919, p. 319], and relates to gas-diverting valves of the rotary type. According to the prior patent, the rotary valve is provided with a hood, which may be moved round upon an axis and upon the body of the valve. The body of the valve is provided with vertical walls, and with inlets and outlets for gas, and the hood is furnished with barriers in triple form, two of which, meeting together at or near the centre of the valve area, contain an area in the form of a sector which is approximately one-sixth of the valve area.

The present invention describes the adaptation of a plug valve in place of the one described in the specification referred to, the hood being dispensed with, and the triple form of barrier device situated in the body of the valve.

The barriers make contact with facings on the valve casing or container.

The modification involves "the use of a number of facings in the valve casing and barriers of the plug valve in such relation to each other that the area through which the gas passes in the valve space may be divided by movement of the valve into other than six equal or approximately equal parts."

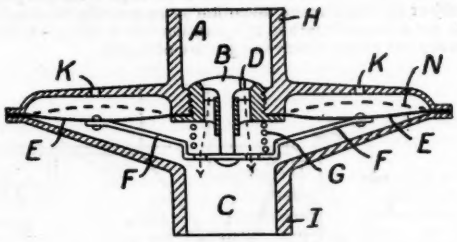
Safety Device for Closing Gas Pipes.—No. 208,082.

DUNCAN, W. F., of Cardiff.

No. 12,012; May 4, 1923.

This invention relates to a safety device for gas pipes, automatically closing a pipe when the supply of gas ceases.

The patentee's object is to provide an automatic device in which a valve when closed only opens again after all outlet taps are closed, and which can be made cheaply, can be easily fitted to the pipe, and when in use is reliable. The device is independent of any connection with the mechanism of the meter, and can be fitted in any position on the pipe and at any angle.



Duncan's Safety Device.

One form of the safety valve is shown in section herewith. The parts marked H and I will be threaded to enable the device to be easily fitted to the pipe. The gas enters at A, but is unable to pass until the valve B is raised. This is raised by allowing a small quantity of gas to pass the valve through a small hole D, or through a small channel formed on the valve seating. This small quantity of gas passes into the pipe I; and should any burner taps not be turned off, it passes out of the pipe, having no effect. But when all the taps are closed, it fills the pipe, and the pressure in the chamber C lifts the diaphragm E, as shown by the dotted lines, and the valve B, being connected to the diaphragm by the plate F, is opened. The spring G is for the purpose of closing the valve when the supply of gas ceases; and the small vents K allow the air to pass from N when the diaphragm moves.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Dec. 31.]

Nos. 32,231 to 32,637.

ADAMS, A. E.—"Dry gas-meter." No. 32,531.
BRITISH MANUFACTURERS AND INVENTORS GUILD.—"Fire-lighting gas-torches, &c." No. 32,373.
GARSIDE, T.—"Gas supply means for incandescent gas-lights." No. 32,263.
HARBORD, A. E.—"Geyser." No. 32,480.
KENDALL, D. J. P.—See Adams, A. E. No. 32,531.
KERSHAW, H.—See Garside, T. No. 32,263.
KIRKE, P. ST. G.—"Waste-heat boilers." No. 32,414.
MACE, B. E.—"Prepayment gas-meters." No. 32,383.
SHANNON, J.—"Gas cooking-stoves." No. 32,542.
SUTHERLAND, LTD., A. G.—See Mace, B. E. No. 32,383.
SWAN, J. W.—"Incandescent gas burners." No. 32,274.
WHITFIELD, G. J.—See British Manufacturers and Inventors Guild. No. 32,373.

New Gas Showrooms at Longton.—That the Gas Department of the Stoke-on-Trent Corporation are not lacking in a desire to place the best service possible at the disposal of the public, is evidenced by the recent opening of new showrooms in Market Street, Longton. These are part of a scheme advanced by Mr. A. Mackay, M.I.Mech.E., Chief Engineer and General Manager, with a view to inducing householders to make the most of the extensive facilities by the Department. The new premises are very commodious. The interior has been structurally altered and redecorated to form very handsome and spacious rooms admirably suited for the purpose.

Overcome by Gas Fumes.—While two workmen in the service of the Glasgow Corporation Gas Department were at work repairing pipes underneath a tenement of houses in Clarence Drive, Glasgow, last week, they were overcome by gas fumes. Both were entombed for over an hour before they were rescued in an unconscious condition by the police and a detachment of the fire brigade and ambulance corps. The floor of the dwelling and the concrete pavement were smashed through before the men were extricated, and two ambulance men assisting with the rescue had a narrow escape, as both were partially overcome by the fumes, and had to be medically treated.

Bournemouth Gas Company's Record Output.—The issue of the "Co-Partner" magazine of the Bournemouth Gas and Water Company for December states that the recent inclement weather very severely taxed the gas-making resources of the undertaking, and remarkable increases in outputs have been recorded. On Friday, Nov. 30, the Company sent out 7,436,000 c.ft. of gas, as compared with their previous record output of 6,375,000 c.ft. on Jan. 24, 1922. The output for the week to Dec. 1 was 47,367,000 c.ft., as compared with 38,059,000 c.ft., in the corresponding period of the previous year—an increase of 24·72 p.ct., while the increase over the fortnight was 18·94 p.ct.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade for Orders under the Gas Regulation Act.

Southport Corporation.

The maximum prices now authorized in respect of the supply of gas by the undertakers are 4s. per 1000 c.ft. within the borough, and 4s. 6d. outside; and the prices they have asked the Board of Trade to substitute for these are 1s. and 1s. 1d. per therm respectively.

DECLARATIONS OF CALORIFIC VALUE.

Borough of Walsall.—450 B.Th.U. (April 1.)

Wells Gas Light Company.—475 B.Th.U., in substitution for 450 B.Th.U. (April 1.)

GAS REGULATION ACT ORDERS.

We have received from the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Petersfield and Selsey Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 16·6d. and 19d. per therm; and these prices respectively shall be substituted for the prices of 4s. and 5s. per 1000 c.ft. mentioned in section 37 (dividend dependent on price charged) of the Petersfield and Selsey Gas Act, 1911.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-one-half. (Jan. 1.)

Teignmouth Urban District Council.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 15·6d. per therm.

After the declared date, the price of 13·2d. per therm shall be substituted for 3s. 6d. per 1000 c.ft. in paragraph (2) of Article XXIV. (application of gas revenue) of the Teignmouth Order, 1905.

Prepayment meter clauses are included. (Jan. 4.)

REVISED SCALE OF CHARGES AT MACCLESFIELD.

Last month the Macclesfield Corporation Gas Committee adopted a revised scale of charges. The new rates for ordinary and power consumers take effect from the December meter readings, and the rebates to users of prepayment meters from the 1st inst.

Revised Prices Per Therm.

ORDINARY CONSUMERS. Where the quarterly consumption:	d.
1.—Is less than 40 therms	10·0
2.—Is 40 and under 100 therms	9·5
3.—Is 40 and under 100 therms and the consumer owns gas appliances approved by the Gas Engineer	9·0
4.—Is 100 and under 250 therms	9·0
5.—Is 100 and under 250 therms and the consumer owns gas appliances approved by the Gas Engineer	8·5
6.—Is 250 therms and over	8·5
7.—Is 250 therms and over and the consumer owns gas appliances approved by the Gas Engineer	8·0

PREPAYMENT CONSUMERS. Where the quarterly consumption:	d.
1.—Is 30 therms or under (being 2d. in each 1s. rebate).	11·02
2.—Is over 30 therms or 2s. per week (being 2½d. in each 1s. rebate).	10·47
3.—Is over 30 therms or 2s. per week, and the consumer owns gas appliances approved by the Gas Engineer (being 3d. in each 1s. rebate).	9·91

Consumers desirous of obtaining the reduced price under sections 3, 5, and 7 for ordinary consumers, and section 3 for prepayment consumers, and having any stoves, fires, wash boilers, geysers, water heaters, or radiators heated by gas, must apply to the Gas Engineer for a form giving particulars of the appliances, which must be approved by the Gas Engineer before the reduced price takes effect.

Consumers for Trade Purposes.

The present price of 10·71d. per therm to be abolished, and the consumers to come under the above sliding-scale for ordinary consumers.

Power Consumers.

Present price, 10·47d.

Revised prices:

Consumption per B.H.P. of maximum demand.	d.
1.—Under 160 therms per annum	7·5 per therm.
2.—160 therms and under 180 therms per annum	7 ,,
3.—180 therms and under 200 therms per annum	6·5 ,,
4.—200 therms and over per annum	5·25 ,,

The Smethwick Gas Committee have accepted the tender of the Birmingham Railway Carriage and Wagon Company, Ltd., for the supply of 100 railway wagons at a price of £16,200.

TORONTO CONSUMERS' GAS COMPANY.

The Annual General Meeting of the Company was held in Toronto on Nov. 19, 1923—Mr. A. W. AUSTIN (the President) in the chair.

The Directors reported that during the year ended Sept. 30 there had been an increase of 5041 in the number of consumers, and an increase of 8·68 p.ct. in the output of gas. The net earnings for the year were $1,384,704; and after payment of interest, dividends, and plant and buildings renewal fund charges, there remained a surplus of $95,862, which has been carried to the special surplus account. The present schedule of rates has been in effect for the full year, and, as compared with the price for gas reached in 1921, represents an actual saving to the consumers of the Company of more than $1,102,000 for the year. The prices of commodities entering into the cost of gas still remain at very high levels, and a large proportion of the Company's operating expenses are, even yet, more than double the pre-war costs.

During the year a census was taken of all gas-consuming appliances in use in Toronto. A similar census was taken in 1910; and a comparison of the number of some of the more important units in use in that year with the number in use to-day illustrates the tremendous expansion that has taken place in the utilization of gas in the intervening period.

	1910.		1923.
Gas cooking-ranges	19,620	..	109,033
Gas-rings	20,434	..	35,354
Gas fireplace appliances	4,531	..	7,508
Gas water-heaters, ordinary	3,217	..	34,122
,, ,, automatic.	None	..	2,735

It was with a great deal of regret that the Directors recorded that, on Feb. 8 last, the worst accident that the Company have experienced in their history occurred in the valve-house at the Station B plant on Eastern Avenue, when ten of the Company's employees lost their lives from asphyxiation. Among the dead were some of those who, disregarding their own safety, made heroic efforts to rescue their comrades. The immediate financial needs of the bereaved families were taken care of by the Company, in addition to which the Company have substantially augmented the pensions awarded by the Workmen's Compensation Board. A tablet has been erected in the office at Station B plant, in memory of those who so tragically lost their lives while doing their duty.

The following statement for the past, as compared with the preceding, year shows:

	Meters.		Gas Sales.
Year ended Sept. 30, 1923	137,182	..	$5,392,860
,, ,, Sept. 30, 1922	132,141	..	5,408,829
Increase	5,041		
Decrease			$15,969

The PRESIDENT remarked that the Company had now completed their seventy-fifth year in the public service,* and despite its age, the undertaking was very active, and still growing. The present report and accounts could not fail to be considered highly satisfactory to the shareholders. Gas was rapidly being made available for practically every purpose in industry for which heat was required. Its application to industrial purposes received special attention by the Company, who had no fear as to the future of gas.

Mr. ARTHUR HEWITT (the General Manager) pointed out that the rate of wages had not been reduced since the war. During the life of the Company there had only been three Managers, but he had served under five Presidents. It was no small honour to be Manager of a Company with this long history of keen regard, not only for their statutory obligations, but for their moral obligations as well.

The report and accounts were unanimously adopted.

* Further reference to what the Company have accomplished over this long period will be found on p. 35 of last week's issue.—ED., "G.J."

Darlington Gas Price.—Mr. H. Maw asked, at a meeting of the Darlington Town Council last Thursday, if there was any chance of a reduction in the price of gas, for they liked to be ahead in Darlington. They had the cheapest electricity in the North, and he thought the Committee might consider a reduction in the price of gas. At the same time, he had no desire whatever to press the Chairman. Mr. S. Leng replied that, owing to a serious increase in the price of coal, they had not been able to reduce the price of gas as they had hoped. The Committee, however, intended considering the matter definitely next month.

New Holder for the Middlesbrough Corporation.—After a general survey of the town, Mr. C. F. Blincoe, the Gas Manager, has reported to the Middlesbrough Gas Committee the suitability of a site at Newport of approximately six acres for the erection of a 3 million c.ft. holder and tank. The Committee have decided to engage a consulting engineer, to advise on the site, the form of holder and tank, and other matters. Complete plans and estimates are being prepared. The Committee have suggested that the land adjoining the site should be acquired for the purpose of future gas-works developments. When all formalities have been completed, the Manager is to invite tenders for construction and erection.

Increased Output at Malvern.—The Gas Manager (Mr. E. D. Wootten) reported to a meeting of the Malvern Urban District Council last week that the make of gas for the four weeks ended Dec. 8, 1923, as compared with the previous corresponding period, showed an increase of 3,142,000 c.ft., and that the estimated total make for the year ending March 31 next would exceed 180 million c.ft. It would therefore be necessary to enlarge different parts of the works in order to cope with the demand. The Gas Committee had authorized the Gas Manager to obtain information on the most up-to-date systems of gas manufacture. In the meantime they recommended the purchase of new retorts for re-setting two beds, and that the tender of Messrs. Harrison be accepted.

STATISTICS OF RATES AND CHARGES.

Many Welcome Decreases.

From Mr. W. Allison Davies, the Borough Treasurer of Preston, we have received the thirty-ninth of a series of annual statements, prepared with the object of showing the actual rates levied in various towns, and the extent to which such rates have been increased or reduced by municipal undertakings and estates. The return serves a distinctly useful purpose, but the compiler himself draws attention to the fact that it is not intended to demonstrate the desirability or otherwise of municipal trading. In addition to the rates levied, and the enumeration of profits and losses on municipal undertakings, information is again given as to charges for gas, water, and electricity made for domestic purposes only. Gas undertakings which have adopted the basis of charge provided for by the Gas Regulation Act are indicated; the equivalent charge per 1000 c.ft. being given in the return.

The particulars are for the year 1923-24, and the statistics which relate to the rates levied are of the usual complete character. The total rates in the pound levied are shown, with the corresponding figures for the previous year, and the rates per head of the population at Midsummer, 1922. Looking over the thirty-six columns of which the return is comprised, one is glad to note that the tendency towards a somewhat lower figure in the pound for total rates which was noticeable a year ago is again in evidence. The information furnished has reference to 28 Metropolitan boroughs, 83 county boroughs (one more than last time), 85 boroughs, and 47 urban district councils (five less than before). One must recognize the great amount of work involved in collecting and arranging the particulars relating to so many places, though Mr. Davies admits that his efforts would have been fruitless without the co-operation of the officers of the localities dealt with.

Glancing first at the Metropolitan boroughs, there is a general reduction in the total rates levied. In Bermondsey the total is 18s 6d., in Stepney 15s. 6¾d., and in Deptford 15s. 5d. The improvement seen in London in this respect extends to the Provinces. The average total rates levied for the 83 county borough towns included in the list is 13s. 11¾d. in the pound for 1923-24, which compares with 15s. 6¼d. a year ago, and 16s. 11¼d. for the twelve months before that. The average for the 85 boroughs included, at 13s. 1½d., compares with 14s. 6d. for 1922-23, and 16s. for 1921-22. In the case of the 47 urban district councils, the average is now 13s. 10¼d., against 15s. 9¾d. a year ago, and 17s. 4d. for the twelve months before that.

With this further reduction in the average rates levied, there has naturally been another shrinkage in the number of places in which the total impost reaches 20s. in the pound or over. In 1921-22 there were 26 such cases; but a year ago this number had been reduced to 20, and on the present occasion there are only 8. The places named by Mr. Davies in which a levy of 20s. or more is made for 1923-24 are: Merthyr Tydfil, 25s. 6d., which continues to hold the high rate record for county borough towns; Walthamstow, 24s. 4d.; West Ham, 23s. 5d.; Aberdare, 23s.; Poplar, 23s.; Leyton, 22s. 3d.; East Ham, 22s. 2d.; and Middlesbrough, 20s. In only one instance is the figure an increase over that of the previous year, the exception being Poplar, where the amount levied has gone up from 22s. 8d. to 23s. A similar increase—from 14s. 4d. to 14s. 8d.—has taken place in the case of Blackburn; but elsewhere the rates have either been reduced (and this is so in the great majority of the places listed) or remain the same as before. This falling-off is very welcome; and, with the high level which had been reached in most directions, there is room for hope of further changes of a similar nature.

A year ago the return included seven instances in which the rates were under 10s. in the pound; Blackpool enjoying the honour of bottom place in the list with 8s. 3d. (approximate average). On the present occasion seventeen places come within this category, and Blackpool, at 7s. in the pound, shares its position of honour with Bebington and Bromborough at 7s. The other fifteen places below 10s. in the pound are: Oxford, 8s. 2¾d. (approximate average); Southport, 8s. 4d.; Bournemouth, 8s. 5d.; Hove, 8s. 10d.; Tunbridge Wells, 8s. 10d.; Darlington, 9s.; Stretford, 9s. 3d.; Eastbourne, 9s. 4d.; Bexhill, 9s. 6d.; Belfast, 9s. 8d.; Kendal, 9s. 8d.; Birkenhead, 9s. 9d.; Chelmsford, 9s. 10d.; Salisbury, 9s. 11d.; and Coulsdon and Purley, 9s. 11¼d. Ratepayers at Erith have been much more fortunate—or, perhaps, less unfortunate—than a year ago, for in their case there is a reduction from 27s. to 17s. 4d. Among other substantial decreases may be mentioned Halifax, with a fall of 8s. 5d. in the pound; Camberwell, 5s. 3d.; Hull, 4s. 10½d.; Liverpool, 4s. 6d.; Southampton, 4s. 1½d.; Southwark, 4s. 0¾d.; Norwich, 4s.; Lambeth, 3s. 8d.; and Birkenhead, 3s. 3d. None of the Metropolitan boroughs come below the 10s. rate; but Westminster figures at no more than 10s. 2d., and Finsbury 10s. 5d.

Looking through the statistics, it is noted that the rates levied in the following few towns have been reduced to the extent of 1s. or more in the pound by transfers from municipal undertakings, &c.; but the figures quoted in the paragraph immediately preceding this one are those of rates actually levied, after allowing for any such transfers: Doncaster, 1s. 3¼d.; Great Yarmouth, 1s. 3d.; Wallasey, 1s. 1¾d.; Barry, 1s. 0¾d.; and Stafford, 1s. On the other hand, there appear the names of three times as many towns where deficiencies on municipal trading undertakings have been incurred, the meeting of which has necessitated increases in the rates exceeding the same minimum. The places in which, through trading losses, &c., the rates have had to be raised by 1s. or more in the pound are as follows: Keighley, 4s. 0¼d.; Bacup, 2s. 4¾d.; Middlesbrough, 2s. 3d.; Aberdare, 2s. 2¼d.; Heywood, 1s. 10d.; Stalybridge, 1s. 8¾d.; Abercarn, 1s. 8d.; Llanelly, 1s. 4¼d.; Merthyr Tydfil, 1s. 4¼d.; Stockport, 1s. 2¾d.; Walthamstow, 1s. 2¼d.; Harrogate, 1s. 2d.; Preston, 1s. 2d.; Buxton, 1s. 1¾d.; Bexley, 1s. 1¼d.; Middleton, 1s. 1¼d.

On the present occasion (as was the position a year ago) there are only six cases recorded in which the profits transferred from gas undertakings in relief of rates reached £10,000. They are: Nottingham, £20,828; Wallasey, £15,000; Bradford, £13,000; Barry, £12,501; Belfast, £11,460; and Salford, £10,000. There are also again but two instances noted of transfers from the rates to municipal gas undertakings in respect of deficiencies; and they are the same as in the preceding statistics—namely, Southend-on-Sea (Leigh), where the Corporation interest ceased on March 31 last, £595, and Swadlincote, £1400. On the other hand, similar transfers on account of electricity undertaking deficiencies occurred at four places: Peterborough, £4650; Woolwich, £3573; Lincoln, £2500; and Ebbw Vale, £1172. The transfers from electricity undertakings in relief of rates amount to £10,000 and upwards in the following cases: Liverpool, £75,000; Sheffield, £36,183; St. Pancras, £32,500; Leeds, £30,000; Bradford, £22,000; Leyton, £21,156; Hackney, £20,835; Bristol, £16,000; Brighton, £15,000; Newport (Mon.), £13,824; Birmingham, Coventry, Salford, and Southwark, each £10,000.

The particulars furnished of charges for domestic supplies of gas, water, and electricity will be found useful for purposes of comparison.

THE FLAVEL TRAINING SCHOOL.

(MESSRS. SIDNEY FLAVEL & CO., LTD., LEAMINGTON.)

First Annual Social.

By invitation of the founder of the above school—Mr. Percival Flavel, J.P.—over one hundred students and youths employed in the foundry enjoyed a very good evening at the Flavel Social Club, The Parade, Leamington, on Friday, Dec. 28. Following a substantial repast, such as lads only can do full justice to, the chair was taken by Mr. Flavel, whose appearance was greeted by three rounds of deafening cheers.

Introducing the Chairman to the students, Mr. W. E. Pengelly, the late Head of the Weston Training School, gave a short address, in which he impressed upon them the fine opportunity open to them for making a success of life, when they reached manhood. Mr. Pengelly then asked Mr. Flavel to address the lads.

The Chairman opened his remarks by saying how delighted he was to welcome them upon such an occasion. Mr. Flavel then proceeded to explain the details of his scheme in founding the training school, and very clearly pointed out the way for the students to obtain the full advantages offered. He touched particularly upon the recreation side of the scheme, pointing out that it should not be looked on merely as play, but a time in which to re-create the energy expended in the school, and in the training foundry. He earnestly appealed to all the students to assimilate carefully the instruction given, and so fit themselves to become really skilled tradesmen and useful citizens.

The Superintendent of the training school (Mr. F. P. Carr) then read the report, and on the students' behalf thanked Mr. Flavel for all that he had done for them. The Foundry Instructor (Mr. W. Plummer) also addressed the lads.

Mr. Flavel then presented the prizes he had offered during the past session, and the winners were called up to receive the useful sets of moulding tools, as well as money grants to the winners of the classes competition.

After the prize distribution, the Sparks Concert Party entertained the lads with their varied and amusing programme. Before the students went home, hearty cheers were given for the Chairman, and to those who so kindly waited upon the boys during the evening.

Gas and the Purity of City Air.

In a letter to "The Times," on "Smoke Nuisance," Mr. Percy Alden, M.P., agreeing that the distinction between visible and invisible impurities is an important one, says: "It is therefore well that patriotic citizens should know that smokeless solid fuels in general, while ridding the atmosphere of tarry particles of soot—the principal element in smoke—do not effect a very material reduction in the amount of sulphur, the chief pernicious invisible pollution emitted from the chimney. The use of gas, on the other hand, goes a great deal farther towards the achievement of purer city air, because practically all the sulphur impurities in gas are, and legally have to be, extracted at the gas-works in the purification process." As to the argument that electricity goes even farther still, being "of all heating agencies now available in cities the only one that does not foul the air," Mr. Alden remarks that: "This is quite true so far as the use of electricity is concerned. But it has to be added that in its production most generating stations in this country are at present burning raw coal on a lavish scale in their furnaces—considerably more, in fact, than would be burned by individual consumers if they reverted to the use of coal and obtained from it the same service as they at present secure from the electric current. Despite, therefore, the admittedly better conditions under which coal is burned in electric generating stations, these stations are emitting a vast quantity of impurities, visible and invisible alike; and electricity will remain far from a complete cure for atmospheric pollution until a smokeless fuel is employed for the generation of the current. Coke is the only generally practicable smokeless fuel for this purpose. Coke implies the carbonization of coal; and it is, therefore, upon carbonization, by whatever process, that the practical solution of the smoke problem ultimately depends."

Southport's Gas Extensions.—The Southport Corporation Gas Committee are applying to the Ministry of Health for sanction to borrow £63 000 for various purposes connected with the gas undertaking. The price of gas has been reduced 3d. per 1000 c.ft. for the current quarter, and a further decrease of 3d. is to be made in the quarter commencing March.

Retford Gas Prices.—Mr. A. Peatfield, at a meeting of the Retford Town Council last Friday, referred to the price of gas, and said it was absurd for the Corporation to charge 3s. 10d. per 1000 c.ft. He suggested that they should consider the advisability of making a reduction. Alderman Williamson said a reduction in the price of gas was in contemplation, but as the tradesmen of Retford did not reduce their prices at Christmas time, when their windows were full of goods, the Gas Committee also considered they should deal with the question of a possible reduction at a more favourable season of the year.

THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

Towards the end of the week under review, the market has made an attempt to emerge from holiday conditions. Low outputs, and arrangements made in advance by collieries, merchants, and shippers to cover the Christmas and New Year period, have deprived the market of any great interest.

The feeling, if any, is that perhaps things have not opened quite so strong. This is attributed to French troubles, and a slackening in the demand from that quarter. The Seine floods have not been without their effect on shipments; but probably more serious is the adverse movement of the franc exchange rate, which is bound to cause Frenchmen to turn greater attention to reparation coal. Steam coals have been rather firmer, on the arranging of further credits for Germany; but this chiefly affects Northumberland, and has little effect on Durham gas makes in which we are chiefly interested. The latter, however, quote steadily under good average demand. Wear specials at 25s., best qualities (Holmside, Boldon, New Pelton class) 24s. 6d. to 25s., and others 23s. 6d. to 24s. Bookings are good well into next month, and everything points to prices holding.

As to prospects for this year, little or nothing can be predicted with any certainty, or even safety. Good sales have been made by most collieries over the whole period—best qualities on the basis of about 23s. 6d. to 24s. 6d., and others 22s. 6d. to 23s. 6d. But what of the rest? There are several factors which at present cannot be calculated with any accuracy at all. In the past year, home demand for industrial purposes has been far below normal, while export demand has been sufficient to keep the pits working full time practically all through, and at times to raise the price to "fancy" figures. (At one time gas was as high as 35s., and coking still more.) Reports on every hand of late point to the possibility of improving trade conditions at home. In the prevailing uncertainty of the political situation, will these materialize, and with them, will the demand for industrial coal for home consumption return? On the other hand, reports from the Ruhr are to the effect that the mines there will rapidly increase their production, and before very long be in full swing again. The effect of this on the Continental demand for British coal is hard to forecast. So much must depend on general conditions in Germany, who, in spite of all her troubles, has continued throughout to take large quantities of our coal. Improved industrial conditions on the Continent, consequent upon better conditions in the Ruhr, might absorb a good deal of the extra coal that will be produced. And, given improved home demand to counterbalance any falling-off in export, the present strength of the coal market might easily be maintained.

Then what of conditions within the industry itself? It is idle not to face the menace which undoubtedly exists in view of the three months' notice which no one doubts will be given to terminate the agreement. The individual miner in this part of the country does not want a stoppage; but he will probably vote as he has been advised, to see if there is anything more to be had. But there is the danger of the extremist element to be reckoned with, who are always out to make trouble for private ownership, and of the huge mass of the Federation plunging into trouble almost without realizing it. It is significant that the American miners' agreement is due to expire at the end of March. Three months should suffice for a good deal of negotiation, and it is sincerely to be hoped that a settlement can be reached.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

There appears to be a great scarcity of all descriptions of coal in Yorkshire and Lancashire at the present time. A considerable demand for fuel for industrial purposes is reported; but while the export section is not moving quite so freely, there is no lack of orders for some time to come. Furnace coke is also in better demand, and it is reported that some of the ironmasters are prepared to pay 4s. per ton over and above the figure agreed upon between producers and consumers.

There are a few gas coal consumers who have not yet made their purchases, and it is said they will have to pay quite 3s. or 4s. per ton more than if they had bought during the summer months, because the quantities are not large. A few are desirous of obtaining spot lots, as they are fearful of a coal strike.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

The equilibrium of transport, which was restored in large measure during the Christmas season, is upset again by untoward weather conditions. With demand running ahead of supply, this is causing no little anxiety. Gas engineers are making inroads on their stocks, and, however substantial their margin of safety, they cannot see them diminish without perturbation. Many public undertakings that have ample storage capacity have been steadily pursuing a policy of strengthening their reserves as a measure of protection against contingencies in the labour world and elsewhere. The stringency which has developed raises almost insuperable obstacles to the maintenance of the balance.

In the general trade there are considerable arrears to be overtaken. Prices have undergone several changes, all in an upward direction, since some of the unexecuted orders were originally placed. Collieries which did not revise their quotations between the beginning and the end of December have put them up from 1s. to 3s. this month; the rises applying principally to house coals, but in lesser degree to industrial fuel also. Slacks are short and dear.

Premiums amounting to 3s. or 4s. over the 24s. at ovens are being paid for furnace cokes. The basis named now relates exclusively to contracts entered into between the associated interests, and pig-iron production can only be augmented by competing for supplies in the open market, where owners of furnaces that are unfavourably placed in regard to the sources of supply find the terms prohibitive.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON. *Jan.* 7.

The market for pitch continues quiet, and practically no business is reported. The price is quite nominal. Creosote is firm at 10d. to 10¼d. per gallon net in bulk at makers' works. Other products are without material change.

Tar Products in the Provinces.

Jan. 7.

Although no actual sales of importance of pitch are reported, there is certainly more inquiry, and in many cases for immediate delivery. The orders for refined tar now being booked will certainly mean that the storage for this product will commence at once, and shorten the make of pitch, in many quarters. Other products remain the same.

The average values for gas-works products during last week were: Gas-works coal tar, 62s. 6d. to 67s. 6d. Pitch, East Coast, 87s. 6d. to 90s. f.o.b. West Coast—Manchester, 82s. 6d. to 85s.; Liverpool, 83s. 6d. to 86s.; Clyde, 84s. 6d. to 87s. Benzole 90 p.ct., North, 1s. 0¼d. to 1s. 1d.; crude 65 p.ct. at 120° C., 9¼d. to 10d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 5d. to 1s. 7d. Toluole, naked, North, 1s. 5d. to 1s. 7d., nominal. Coal tar crude naphtha in bulk, North, 7¼d. to 8d. Solvent naphtha, naked, North, 1s. 1d. to 1s. 2d. Heavy naphtha, North, 1s. 4d. to 1s. 6d. Creosote, in bulk, North, liquid, 8¼d. to 9d.; salty, 8¼d. to 8¾d.; Scotland, 8¼d. to 8¾d. Heavy oils, in bulk, North, 9d. to 9¼d. Carbolic acid, 60 p.ct., 3s. to 3s. 2d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Manchester District Tar Prices.

The average price realized for the sale of tar in the Manchester district, according to the sliding-scale, for the month of November, was £5 7s. 3·59d.

Tar Products Last Year.

Reviewing, on Dec. 31, the course of the tar products market in 1923, Messrs. Sir S. W. Royse and Co., Ltd., of Manchester, say the hopes for better trade have not been realized, and with few exceptions prices have tended downwards. Benzoles have had only a moderate demand, and values have gradually weakened. The reductions in petrol in July and September helped to depress the market still further, and prices are now 1s. 2d. to 1s. 3d. per gallon, against 1s. 10d. per gallon in January. There has not been much inquiry for toluoles, and, in conformity with benzoles, values have fallen. Owing to the depression in the waterproof trade, consumers of solvent naphtha have shown great reluctance to make forward purchases, covering only their immediate needs; and, with plentiful supplies and only a small export demand, the tendency all the year has been downward—prices having fallen from 1s. 9d. in January to 1s. 1d. to-day. Creosote commenced the year rather quiet at about 6¾d. per gallon. The position strengthened in February, and has since been well maintained; values in December being about 8¼d per gallon. The main factors were the export demand and the requirements of dehydrated tar for the roads, though the latter were below anticipation, owing to the wet weather. Crude carbolic acid supplies have been scarce, and readily absorbed in consumption; prices have varied from 2s. 4d. in January to over 4s. in March and April, subsequently remaining fairly steady until November. The market is now showing signs of weakness, and lower quotations are mentioned. In naphthalenes the refined product has been erratic, but crude has had a more steady demand, and fair values have been obtained.

The easy tone in the pitch market existing at the end of 1922 changed early in January, increased figures being recorded. Continental consumers were compelled to come on the market for large supplies, with the result that by the end of the shipping season prices had advanced beyond all expectations. However, by the end of May a heavy fall in values took place, and little business passed until the autumn. It was reported that Continental buyers carried over from last season stocks of pitch higher than the average, and this, together with the uncertainty of the Ruhr position, affected values, which were again easier in September. October, however, brought considerable inquiries, and for several weeks prices advanced. In November it was difficult to find genuine buyers, and since then the situation has been a nominal one, with business passing at considerably reduced figures. The South Wales position has been difficult, owing to the large quantity of American pitch contracted for by the fuel makers. The question of inferior quality has apparently been overcome, and consumers seem to have been able to cover their requirements of English pitch at prices considered reasonable.

In sulphate of ammonia the demand has been fairly good, for both the home and export markets. The returns for January-November show 230,598 tons, as compared with 127,338 tons for 1922. The figure for the same period of 1913 was 295,930 tons.

Carbonizing Plant at Granton.—In view of the increase in the consumption of gas, the Gas Committee of the Edinburgh Town Council have been considering the question of the provision of additional gas manufacturing plant. The present retorts were put in when the station was built at Granton, over twenty years ago; and while it is not proposed to supersede them, it has been found necessary to make additions. A report has been prepared by the Gas Engineer (Mr. H. H. Gracie) as to the various types of vertical retorts which are in operation in different cities. The Committee have considered this, and, while of opinion that the introduction of vertical retorts would shortly become necessary at Granton, they decided to delay making any recommendation to the Council until a further report had been obtained from the Engineer giving information desired by some of the members.

New Gas Prices at Chesterfield.—By a typographical error on p. 45 of last week's issue of the "JOURNAL," the new reduced price of gas for cooking and heating (domestic) at Chesterfield was given as 6⅞d. net per therm, instead of 6⅛d.

Dewsbury and Coke-Oven Gas.—Negotiations are proceeding between the Dewsbury Gas Committee on the one hand, and the Ossett Corporation and Benzole and By-Products, Ltd., on the other, with reference to a possible supply of gas from the Company's coke-ovens.

Cheaper Gas at Wolstanton.—At the Wolstanton Urban Council meeting last week, Mr. W. J. Hassam, Chairman of the Gas Committee, reported that they had come to the conclusion that they could afford to risk a further reduction in the price of gas to the extent of 4d. per 1000 c.ft. The price to the consumer was now more favourable than it had ever been in the history of the Wolstanton concern. He also referred to the recent improvements in the supply mains.

Standard Price at South Shields.—The question has been raised at South Shields of applying to the Board of Trade for a revision of the Gas Company's standard price; and a report by Mr. W. R. Herring advised that action should be deferred until the publication of the Company's accounts for 1923. The Gas Committee have resolved to adopt this course. In reply to a suggestion by the Town Clerk, the Gas Company have expressed their willingness to meet representatives of the local authorities concerned in conference on the matter.

Growing Demand at Worcester.—The Worcester City Council have authorized the Gas Manager (Mr. E. L. Adlington) to obtain information on the most up-to-date systems of gas manufacture now being installed. During the past year, 170,576,000 c.ft. of gas was made, as compared with 134,693,000 c.ft. for the previous year. The Manager's estimate is that the total make of gas for the year ending March 31 will exceed 180,000,000 c.ft. It will be necessary to enlarge different parts of the works, in order to cope with the demand, which will have to be met by the winter of 1925.

Use of Gas in a Foundry at Bourne Valley.—The usefulness of the Bournemouth Gas and Water Company's administrative work has been added to by the introduction of a new foundry at Bourne Valley. The equipment (supplied by Messrs. J. Evans & Co.) consists of a cupola, 2 ft. internal diameter by 15 ft. 6 in. high, of a capacity of 15 cwt. of iron per hour, and supplied with air by a centrifugal fan driven by a gas-engine. In order to handle the heavy weight easily, there has been installed a 1-ton transporter crane with a 5 cwt. travelling block, together with a 10-cwt. runaway with trolley supplied by Messrs. Herbert Morris, Ltd., of Loughborough.

Walter Waugh and Co., Ltd.—Intimation has been received from Messrs. Walter Waugh and Co., of Coronation House, No. 4, Lloyds Avenue, E.C. 3, that, as from the beginning of the current month, the firm have been converted into a private limited liability company, under the name of Walter Waugh and Co., Ltd., and the business previously carried on by the firm will be thereafter taken over and conducted by the new Company from the same address. All the partners in the firm will be Directors of the Company, and there will be no change in the *personnel* or management of the business. All pending contracts will be taken over and completed by the Company in due course.

Excellent Showroom Display at Greenock.—The enterprise of the Gas Department was again to the fore in their Christmas window display. Few people who have passed the showrooms can have failed to be impressed by the "modern room" which the Department constructed in one of their windows. This cosy room, fitted with all that is best in gas-apparatus, was of great interest. The room was a model of cleanliness and tidiness; and during certain evenings two young ladies were to be seen enjoying the delights of wireless amid such excellent surroundings. The display attracted so many people that the police threatened to prosecute; but the Department effected a compromise by having a special policeman to patrol in front of the windows.

Imperial Continental Gas Debentures.—The following circular has been sent by the Secretary of the Imperial Continental Gas Association to holders of the 3½ p.ct. debenture stock: "On Dec. 6 I sent you a communication stating that the Association were willing to exchange during a limited period an equal nominal amount of 3½ p.ct. Conversion Loan for any holdings of the Association's 3½ p.ct. debenture stock, and, at the same time, informing you that the offer made by the Board in August last to purchase direct, at the price of £77 for £100 stock, any holdings not exceeding £100 stock was still open. £105,000 of the Association's debenture stock having been surrendered on the above basis, my Board have decided to close the offer on Jan. 15. If therefore you wish to avail yourself of it, please let me have your acceptance by that date. The offer to redeem, at the price of £77 p.ct., any holdings not exceeding £100 stock will also be withdrawn on the same date." The "Financial Times" understands that, in addition to the £105,000 of stock mentioned as having been surrendered, the Association have purchased recently on the open market approximately £30,000 of stock.

Dublin Gas Workers' Wages Cut.—A reduction of 6s. a week in the wages of all sections of their working staffs, except boy helpers, was proposed by the Alliance and Dublin Gas Consumers' Company, to take effect as from the first pay day this year; but the Transport Union notified the Directors that if the reduction was put into operation the men would cease work. In reply to the Union's communication, Mr. W. J. Grey (the Secretary to the Company) wrote that, in the opinion of the Board, a wage reduction of 1s. per day or per shift was overdue, and that equivalent reductions had been accepted, after prolonged and injurious strikes, by dockers and chemical workers in the city. A proposal for a ballot of the men was then made, but, meantime, the Free State Ministry of Industry and Commerce intervened, and it was arranged to hold a conference between representatives of the Company and the workers. The conference sat for nine hours, and at the close it was announced that the men's representatives had accepted the reduction, which is to be enforced at the rate of 3s. weekly now, and a further 3s. a month later. The minimum wage up to Dec. 28 was 64s. a week. About 700 men are affected by the reduction, the clerical staff being included.

Reduction at Yeadon.—The Yeadon and Guiseley Gas Company have reduced the price of gas, as from the December meter readings, to 9·8d. per therm (3s. 10·55d. per 1000 c.ft.).

Damage to a Generating Station by a Mouse.—The Aberdeen Town Council passed a report this week stating that it would cost from £1700 to £1800 to repair damage caused at the main electric generating station by a mouse, which entered one of the extra high-tension cubicles, causing a short circuit.

Brighouse and the Minimum Pressure.—It has been resolved by the Brighouse Gas Committee that, when making application to the Board of Trade for an Order under section 1 of the Gas Regulation Act, permission shall be sought for a reduced minimum pressure in certain parts of the borough for the next three years, in order to give time for such mains to be laid as will furnish the usually prescribed pressure.

Destruction of Power Station at Clacton-on-Sea.—The electric power station at Clacton-on-Sea was destroyed by fire last week. Oil fuel which was being pumped from the tanks overflowed and came into contact with a gas-jet. Three Diesel engines, with accompanying generators and plant, were destroyed; and the damage is estimated at about £150,000. It will probably be six months before a full supply of electricity is available in Clacton.

Baffles for Geysers.—The "Western Press" for Jan. 1 published a letter from Mr. G. H. Thomas, of Bristol, an Associate Member of the Institution of Heating and Ventilating Engineers. Mr. Thomas emphasizes the necessity for fitting all geysers with flues, baffles, and cowls, and is of opinion that municipalities should be empowered to enforce by-laws; or, alternatively, that the work of fixing should be restricted to gas companies, who might be held responsible for inspection and proper maintenance.

Reduced Assessments.—The appeal of the St. Ives (Hunts) Gas Company against their assessment was settled last week. The appeal has been pending for many months, and the Company decided to take the expert advice of Mr. E. Howard Collins; the Rating Authority retaining Messrs. Michael Faraday & Co. The result of the appeal is that the Company have obtained a reduction of 59 p.ct. in the assessment. The Lydney (Gloucestershire) Gas Company recently appealed against the assessment on their undertaking, and the appeals were finally disposed of on the 29th ult., with the result that the Gas Company obtained a reduction of 39 p.ct. in their assessment.

Dundee and Adequate Service-Pipes.—The Dundee Town Council have decided to seek parliamentary powers to compel the owners of dwelling-houses in the city to provide their properties with suitable inlet and other service pipes, so as to ensure a sufficient supply of gas. Mr. John Reid, in bringing forward the proposal, said at present the Council had no power to compel landlords to put service-pipes into dwelling-houses which were not adequately supplied. Under section 25 of the 1910 Act the Council had power to put pipes into properties provided they did not damage the properties; but they wished to get authority to compel the owners to put in the necessary pipes themselves. He moved accordingly. Mr. J. G. Fraser seconded, and the motion was unanimously adopted.

Progress at Buxton.—The Chairman of the Gas Committee (Alderman Wall) mentioned at last week's meeting of the Buxton Town Council that there had been an increased output of gas for the period from March 31 to Dec. 8 from 101,400,000 c.ft. to 108,282,000 c.ft. He said that before the appointment of Mr. F. G. Shaw as Gas Manager some twelve or thirteen years ago the maximum day's output was 483,900 c.ft., and last year it was 708,900 c.ft. At the present time they had something like 1500 gas-cookers, and every day the undertaking in this section was making progress. Then it was very satisfactory to record that the gas undertaking had contributed something like £17,000 to the relief of the rates. The Committee intended to make a reduction in the price of gas in the next financial year.

Public Gas Lighting in Cork.—At a meeting of the Cork Corporation Public Works Committee, Mr. J. F. O'Sullivan said there were frequent complaints of the public gas lighting, and in private houses great inconvenience arose owing to the bad illumination. The Corporation, as the largest customers of the Gas Company, were entitled to better consideration; and so, of course, were the citizens. Mr. D. Barry endorsed Mr. O'Sullivan's views, but said there had been a slight improvement of late. Mr. Travers, who attended on behalf of the Gas Company, assured the Committee that complaints were always attended to, and where defective lighting was found the matter was adjusted within twenty-four hours. They had had numerous letters of appreciation of their activities. It was the duty of the Corporation to see to the condition of the public lamps, and he cited a number of instances in which they were suffering from absolute neglect. Mr. D. Morgan said he had no doubt Mr. Travers was correct, and felt sure his statement would do a lot of good in having the service improved. It was decided that the whole question of public lighting should be investigated, and discussed at a later meeting.

Nottingham Geyser Fatality.—A strange fatality was investigated by the Nottingham City Coroner (Mr. C. L. Rothera) last week, in relation to the death of Herbert Naylor, aged 66. The evidence disclosed that deceased went to the Bulwell Ex-Service Memorial Club, and ordered a bath. This was prepared by the steward, who explained to the Coroner that he tested the heat of the water, and turned off the gas under the geyser, before Naylor entered the room. As Naylor had not reappeared an hour later, he became suspicious, and burst the door in. He then saw that the bath was empty and that Naylor, who was apparently dead, was sitting in a chair. Medical testimony disclosed that deceased had been a healthy man, and that death resulted from carbon monoxide poisoning. The steward declared that the geyser was properly ventilated. There was no smell of gas when he opened the bathroom door, and he had never had any complaints from members as to the atmosphere becoming oppressive. The Coroner considered the case extraordinary, in view of the fact that the geyser was stated to be well ventilated. The verdict recorded was that Naylor died from carbon monoxide poisoning. An official of the Club, in expressing sympathy with the relatives of the deceased, promised that the geyser should be tested before being used again.

Teaching of Science.

Prof. Arthur Smithells, in his Presidential Address to the Science Masters' Association, at the King's College for Women, dealt with the position of science teachers as a missionary force in the schools. It was, he said, generally considered that science teaching was now established as a normal part of school education; but he believed there was much less real conviction and change of heart than many people would have one believe. What was really recognized to-day as never before, was the might of science, rather than its right, or, still less, its light. Referring to experiences in connection with the anti-gas training of recruits, which involved 3,000,000 men from all classes of society, Prof. Smithells said there was a disappointingly small dissemination of scientific knowledge of an available kind to be found among our people in a matter where a little real knowledge of elementary science might mean, and often did, the difference between life and death. He was not, however, inviting them to any kind of despondency. There was from outside much real sympathy with their aims, and much to encourage, and perhaps they were impatient and not grateful enough for small mercies. He built great hopes for the future on the existence and work of their Association. They wanted in their pupils, above all, a real live self-acting interest in science, like that of the true naturalist, with a habit of doing what they did with thoroughness both of thought and craftsmanship. The chief advance in science teaching within his recollection, he thought, apart from its quantity, lay in the fact, which teachers had realized, that the results of school teaching of science on the university model were so disappointing as to call for a thorough-going reconsideration. With regard to recent changes conducing to specialization in separate sciences during the last two years of school life, his own judgment and experience led him to look upon them with many misgivings. This was bound up with his belief that an experienced specialist in a university, if he had the qualities of a philosopher, invariably developed strong individuality of view and treatment, and would wish to expound his philosophy to newcomers on the fundamentals, in their play among the simpler material of his subject.

Bilston Gas Company and the Roads.—The question of the condition of the streets, owing to the operations of the Bilston Gas Company, was brought up at a meeting of the Urban District Council a fortnight ago, when Mr. W. T. Fellows asked whether the Council had considered the advisability of handing over the roads of the town to the Gas Company, and complained of the streets being taken up so continuously. The Chairman (Mr. H. Beach) said that of late the Company had been working on the streets a good deal, but the Manager (Mr. W. H. Adams) had informed him that this was due to the fact that during the war period a great deal of inspection of the mains was postponed, and they had had to make investigations for leakage.

Advertising Gas at Sheffield.—A recent "Industrial Supplement" to the "Sheffield Daily Telegraph" contained a long article entitled "Gas in Home and Industry," which well set-out the reasons why gas should be used for industrial purposes, and the many facilities offered by the Sheffield Gas Company. There was also a remarkably effective full-page advertisement, in colours, specially designed to attract the attention of the industrial consumer. In the article it is stated that the Company have again reduced the price of gas. For consumers of quantities in excess of 30,000 therms, the new rate is equivalent to 1s. 11d. per 1000 c.ft. This concession will be greatly appreciated by Sheffield manufacturers.

The Morecambe Corporation have approved a prospective expenditure of £10,000 on extensions of the plant at the gas-works necessitated by the increasing demand for gas.

The Leeds Corporation Gas Committee have delayed, for further information, consideration of an application by a trading firm for permission to fix advertisements to street-lamp standards.

The Oswaldtwistle Urban District Council have declined to receive a deputation from the Accrington Master Plumbers' Association to protest against the gas department carrying out internal fitting work.

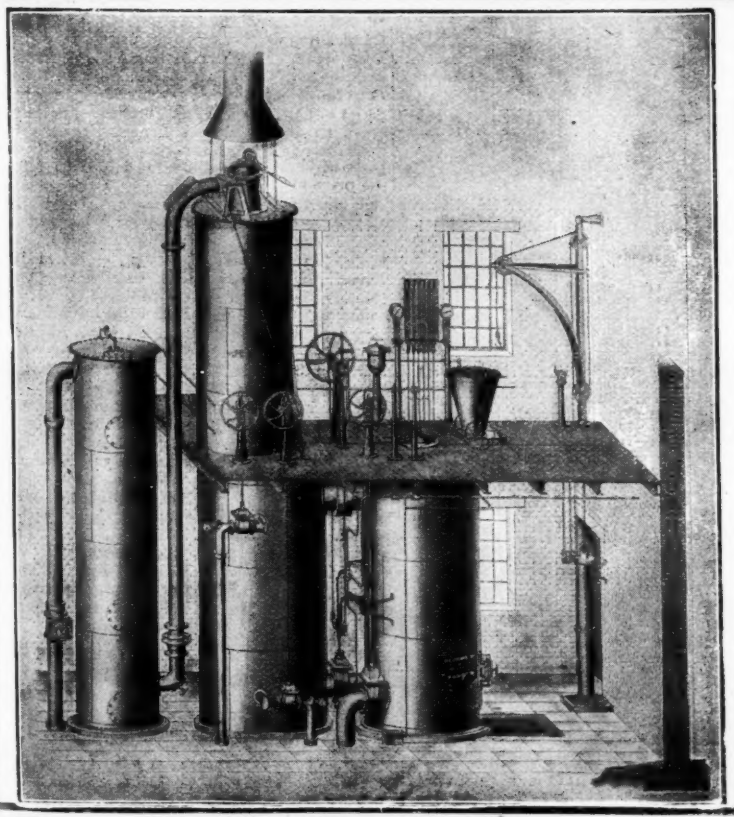
Edgar Morrison was injured in the shoulder and leg by being caught between the buffers of railway wagons while following his occupation at the Keighley Corporation Gas-Works. He was taken to hospital.

There was a slight hitch in the programme broadcasted from the Newcastle station on the 1st inst., owing to the electric lights in the concert room failing. After a few minutes, however, the fault was rectified.

Mr. James Booth, of Edenfield, has been appointed Gas Examiner for the Accrington District Gas Board, at a remuneration of £100 per year, on the basis of 26 tests per quarter. The Examiner's fees will be charged against the five local authorities comprised in the area.

Mr. F. W. Bridges, Organizer of the Shipping, Engineering, and Machinery Exhibition, has left this country for a three months' visit to South Africa, where he hopes to have the opportunity of meeting many of the principal engineers in that part of the world, with the object of increasing the usefulness and success of the next exhibition to be held at Olympia in 1925.

The Batley Town Council last week decided to charge a flat rate of 2d. per unit for electricity for heating and cooking. Opposition was raised, on the ground that this was an uneconomic price, below cost, and unfair competition against the gas undertaking. The reply was that the Electricity Committee expected to make a profit. It was admitted that the price, even on this alternative to the sliding-scale, was about double the cost of gas for such uses.



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STOCK MARKET REPORT.

THE optimism which prevailed at the general improvement in prices which followed the depression brought about by the result of the General Election received a rude shock last week. On Wednesday, prices opened with a moderate degree of strength; but a sharp break in the value of the dollar-sterling and the weakness of the French franc, which reached the record figure of 88·52, brought a complete change in the position.

The gilt-edged market bore the brunt of the general weakness, for which the New York exchange is largely held responsible. War Loan and other leading British Government stocks fluctuated up and down, and War Loan gradually fell to 99⅝. The Victory Loan, however, was only a fraction lower on the week.

Conditions in the Industrial Market were much the same as those prevailing elsewhere. Business remained on a restricted scale. Textiles, Engineering, and Iron and Steel shares weakened; but Bank and Insurance shares were fairly steady.

The Gas Market was no exception to the general rule, and prices were on the low side. Having regard to the short week, there was a fair number of transactions, especially in Gas Light and Coke Company ordinary stock; but, although there was no change in the quotation of this stock, prices were on the low side. There was a big drop in the Wandsworth "A" and Epsom stocks, which both fell 8 points—to 132-137 and 110-115 respectively. Other variations were as follows: Commercial 4 p.ct. and 3½ p.ct. each declined 2, to 92 97; Gas Light 3½ p.ct. maximum fell 1, to 63-66; Imperial Continental 2 points, to 138-143; Primitiva 5 p.ct. preference ⅛; San Paulo 1, to 37-40 *ex* div.; Wandsworth "B" and "C" each dropped 2 points, to 110-115 and 98-103 respectively, and Wimbledon 5 p.ct. fell 5, to 105-110.

The following transactions were recorded during the week: On Monday, European 7⅛, 7¼, Gas Light and Coke, 90½, 91, 91⅛, 91¼, 4 p.ct. preference 80, 3 p.ct. debenture 60, Primitiva 5 p.ct. preference 23s. 9d., 4 p.ct. (Buenos Aires) debenture 55 *ex* div., South Metropolitan 92, 92½, 92¾. Supplementary prices, Leatherhead 5 p.ct. 11⅛, 11½. On Wednesday, Bahia-Blanca "A" 4s. 3d., Bombay 5 1/16, Brentford "B" 101¼, Continental Union 33, Gas Light and Coke 91, 91⅛, 91¼, 91⅛, 91⅜, 3½ p.ct. maximum 63, 64, 64⅛, Imperial Continental 139, 140, South Metropolitan 93. Supplementary prices, Bahia-Blanca "B" 5d., Cape Town 5 p.ct. debentures 74, 74½. On Thursday, Alliance and Dublin 4 p.ct. debenture 61, 61½, Continental Union 34, European 7⅛, Gas Light and Coke 91⅛, 91⅜, 91⅞, 3½ p.ct. maximum 63, 4 p.ct. preference 80, Imperial Continental 139, 140, Primitiva 7s., 5s., 5 p.ct. preference 21s. 10½d., 4 p.ct. (Buenos Aires) debenture 56½ *ex* div., South Metropolitan 92, 93, Swansea 6½ p.ct. debenture 102½ *ex* div., Wandsworth "B" 110. Supplementary prices, Colombo 12, Richmond 5 p.ct. 95, 95½. On Friday, Bombay 5 3/32, 5 5/32, Brentford "A" 101½, 102½, 103, Commercial 3½ p.ct. 92, Continental Union 7 p.ct. preference 81, Gas Light and Coke 91½, 91⅝, 91¾, 91⅞, 92, Imperial Continental 138, 140, Liverpool 7 p.ct. preference 105½, Primitiva 7s., 4 p.ct. debenture 56½, South African 7⅜, 7⅞, South Metropolitan 92, 92½, 93, 3 p.ct. debenture 60, 6½ p.ct. debenture 105, Tottenham "B" 102. Supplementary prices, Tottenham 5 p.ct. preference 90.

As we have indicated, there was a general weakness in the Foreign Exchange Market. On Wednesday, the dollar-sterling rate fell to $4.29. This, with the exception of the fall on Nov. 19, when, on the Franco-British crisis over the question of the return of the Crown Prince to Germany, the value fell to $4.25⅝, is the lowest since March, 1922. At the close of the week, however, a firmer tone prevailed, and the exchange closed at $4.31. Most of the neutral exchanges also rose in sympathy.

The lower average rate—viz., £3 0s. 11·61d.—at which Treasury Bills were allotted was the principal feature of the Money Market. If anything, money supplies were on an even larger scale on Friday, and in some quarters balances were offered at under 1 p.ct.

In the Discount Market, a fair business in short-dated paper was reported again, and, in spite of the low average at which Treasury Bills were allotted, the discount rates displayed a fairly steady tone.

Bar Silver rose on Thursday to 34 1/16d. per oz.—the highest point reached since November, 1922. Selling on American account, however, caused a subsequent decline of ½, to 33 15/16d. per oz.

The Bank rate is 4 p.ct., to which it was raised from 3 p.ct. on July 5. Bankers' deposit rates are 2 p.ct. The deposit rates of the discount houses are 2 p.ct. at call and 2½ p.ct. at notice.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Divid. at Rate of	NAME.	Closing Prices, July 30, 1914.	Variation. Quotations, Jan. 4.	Variation. Lowest and Highest Prices of Transactions.
£			p.c.	% p.a.				
131,978	Stk.	Aug. 9	—	5	Aldershot 5 p.c. max. C.	..	72—77	...
217,992	,,	,,	4	4	Do. 4 p.c. Pref.	..	70—75	...
1,551,868	,,	Oct. 4	2½	5½	Alliance & Dublin Ord.	59—64	60—65	...
374,000	,,	July 12	4	4	Do. 4 p.c. Deb.	76—79	62—67	61—61½
280,000	5	Oct. 18	7½	8	Bombay, Ltd.	5⅛—5¼	5 5/16—5 5/32	5 5/16—5 5/32
100,000	10	Aug. 9	16	8½	Bournemouth Gas and Water { 5 p.c.	..	12½—13½	..
383,110	10	,,	7	7	Bournemouth Gas and Water { B 7 p.c.	15—15½	11½—12½	...
115,000	10	,,	6	6	Bournemouth Gas and Water { Pref. 6 p.c.	13½—14	11—12	...
162,025	—	Dec. 28	—	4	Bournemouth Gas and Water { 4 p.c. Deb.	..	75—80*	...
992,045	Stk.	July 12	14	6 7/10	Brentford A Consolid.	261—266	100—105	101¼—103
734,920	,,	,,	11	6½	Do. B New	204—209	100—105	101½
55,000	,,	,,	5	5	Do. 5 p.c. Pref.	109—111	90—95	...
221,400	,,	Dec. 13	4	4	Do. 4 p.c. Deb.	91—93	76—81	...
214,745	,,	Aug. 23	11	11½	Brighton & Hove Orig.	208—213	175—180	...
344,200	,,	,,	8	8½	Do. A Ord. Stk.	154—159	127—132	...
1,387,500	Stk.	July 26	5	5	Bristol 5 p.c. max.	..	93—95a	...
570,000	20	Oct. 4	12½	12	British A Ord.	44—45	118—123	...
100,000	10	Dec. 28	—	7	Do. 7 p.c. Pref.	..	120—125*	...
120,000	Stk.	,,	4	4	Do. 4 p.c. Deb. Stk	88—90	73—78*	...
100,000	10	,,	—	6	Cape Town & Dis., Ltd'	1½—2½	6½—7½*	...
100,000	10	Oct. 31	—	4½	Do. 4½ p.c. Pref.	4—6	6—7	...
150,000	Stk.	Dec. 28	4½	4½	Do. 4½ p.c. Deb. Stk.	70—75	73—78*	...
237,860	,,	,,	—	7½	Cardiff 7½ p.c. Deb.	..	105—110*	...
157,150	,,	Aug. 9	5	5	Chester 5 p.c. Ord.	108—110	85—90b	...
1,513,280	,,	July 26	5/9/4	6	Commercial 4 p.c. Stk.	106—108	92—97	...
560,000	,,	,,	5½	6	Do. 3½ p.c. do.	103—105	92—97	92
475,000	,,	Dec. 13	5	5	Do. 3 p.c. Deb. Stk.	69½—71½	58—61	...
800,000	,,	14 Jan. 15	4	—	Continental Union, Ltd.	76—79	32—37	33—34
200,000	,,	Dec. 13	7	7	Do. 7 p.c. Pref.	115—118	78—83	81
660,000		Aug. 9	—	6½	Croydon sliding scale.	..	102—105	...
284,975		,,	—	5	Do. max. div.	..	85—88	...
492,270	Stk.	—	6	4½	Derby Con. Stk.	125—125	107—110c	...
55,000	,,	—	4	4	Do. Deb. Stk.	102—104	74—76c	...
209,000	,,	—	—	5	East Hull 5 p.c. max.	..	..	...
1,002,180	10	July 12	10	5	European, Ltd.	17½—18	7½—8½	7½—7⅝
16,546,120	Stk.	July 26	4/17/4	5½	Gas, Light and Coke { 4 p.c. Ord.	98—102	90—93	90½—92
2,600,000	,,	,,	3½	3½	Gas, Light and Coke { 3½ p.c. max.	76—79	63—66	63—64⅛
4,062,235	,,	,,	4	4	Gas, Light and Coke { 4 p.c. Con. Pref.	96—99	77—80	80
4,761,930	,,	Dec. 13	3	3	Gas, Light and Coke { 3 p.c. Con. Deb.	72½—74½	58—61	to
150,000	,,	Dec. 11	10	10	Gas, Light and Coke { 10 p.c. Bonds	..	..	...
42,000	—	—	—	7½	Gas, Light and Coke { 7½ p.c. Ilford Deb.	..	..	...
82,500	,,	Sept. 19	5	6⅔	Hastings & St. L. 5 p.c.	..	93—98	...
258,740	,,	,,	3½	5½	Do. 3½ p.c.	87—89	78—83	...
70,000	10	Oct. 18	11	10	Hongkong & China, Ltd.	16½—16¾	16—17	...
86,600	Stk.	Aug. 23	9	9½	Hornsey 7 p.c.	..	144—149	...
1,976,000	,,	Nov. 15	9	5	Imperial Continental	150—160	138—143	138—140
401,400	,,	Aug. 9	3½	3½	Do. 3½ p.c. Deb. Red.	84—86	75—77	...
235,242	,,	,,	6½	6½	Lea Bridge Ord. 5 p.c.	119—121	95—100	...
2,127,240	,,	Aug. 23	10	5½	Liverpool 5 p.c. Ord.	—	88½—89½b	...
600,000	,,	Sept. 19	—	7	,, 7 p.c. Pref.	..	104—107b	105½
165,736	,,	Aug. 23	7/5/6	9	Maidstone 5 p.c.	—	125—130	...
63,480	,,	Dec. 28	—	—	Do. 3 p.c. Deb	..	54—59*	...
75,000	5	Dec. 13	6	5	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	44—44	34—34	...
50,000	100	Oct. 1	4½	4½	Montevideo, Ltd.	99—101	95—98	...
541,920	Stk.	Nov. 29	4	4	Newcastle & Gatsh'dCon.	11½—12	48—53	...
1,875,892	,,	July 26	4½	4½	Do. 4 p.c. Pref. Stk.	98½—99½	85½—86½d	...
230,166	,,	Aug. 9	—	4	Do. 3½ p.c. Deb.	..	74½—76½d	...
539,705	,,	June 28	3½	3½	North Middlesex 10 p.c.	82—83	73—74d	...
15,000	10	Aug. 23	—	11	,, ,, 7 p.c.	—	16½—17½	...
75,940	10	,,	7/14/0	7 7/10	Oriental, Ltd.	14—15	11½—12½	...
300,000	Stk.	Nov. 29	8	9	Plym'th & Stonh'se 5 p.c.	117—122	97—102	...
138,120	Stk.	Dec. 28	—	7½	Portsea Island, B	..	105—110*	...
60,000	50	Sept. 6	13	13	Do. C	128—131	105—110	...
100,000	50	,,	12	12	Primitiva Ord.	118—121	100—105	...
1,450,345	5	29 Oct. 14	8	—	Do. 5 p.c. Pref.	5½—6	¼—½	5/—7/-
2,499,800	5	30 Dec. 15	5	—	Do. 4 p.c. Deb.	4½—5	1 1/16—1 1/16	21/-1 1/16—23/9
341,400	100	Dec. 3	4	4	Do. ,, ,, 1911	91—93	70—75	...
600,000	Stk.	July 26	4	4	Do. B. Aires 4 p.c. Deb.	—	55—58	56½
220,135	,,	Dec. 28	4	4	Do. Riv. Pl. 4 p.c. Deb.	85—87	55—58*	55—56½
321,670	,,	,,	4	4	San Paulo { 6 p.c. Pref.	85—87	55—58*	...
150,000	10	Oct. 4	6	6	San Paulo { 5 p.c. Deb.	10½—11	5½—6	...
125,000	50	Jan. 2	5	5	Sheffield A	47—49	37—40*	...
270,000	Stk.	Aug. 23	10	5	Do. B	223—224	100—102s	...
419,968	,,	,,	10	5	Do. C	222—224	100—102s	...
1,047,000	,,	,,	10		Shrewsbury 5 p.c.	220—222	100—102c	...
133,201	Stk.	—	4		South African	—	..	...
90,000	10	Oct. 18	9	6	South Met. Ord.	10½—11½	7—9	7½—7⅞
5,609,895	Stk.	July 26	5/9/4	5	Do. Red. Pref.	111—113	91—94	92—93
250,000	,,	July 12	—	5	Do. 3 p.c. Deb.	—	98—100	...
1,895,445	,,	,,	3	3	Do. 6½ p.c. Deb.	72½—74½	59—62	60
734,000	,,	Sept. 6	—	6½	South Shields Con. Stk.	..	105—107	105
91,500	,,	Aug. 23	8½	8½	S'th Suburb'n Ord. 5 p.c.	137—139	134—136d	...
1,087,795	,,	,,	6	6	Do. 5 p.c. Deb. Stk.	114—116	99—102	...
568,837	,,	Dec. 28	5	5	S'th'mpt'n Ord. 5 p.c. max	116—118	95—100*	...
647,740	,,	Nov. 15	5	5	Do. 4 p.c. Deb. Stk.	99—102	85—90	...
121,275	,,	Dec. 28	4	4	Swansea 7 p.c. Pref. Stk.	..	74—79*	...
250,000	,,	Aug. 23	—	7	Do. 6½ p.c. Deb. Stk.	..	102—104	...
200,000	,,	Dec. 28	—	6½	Tottenham { A 5 p.c.	..	102—104*	102½
120,000	,,	July 26	—	8	Tottenham { B 3½ p.c.	135—138	122—127	...
782,275	,,	,,	6	6½	Tottenham { 4 p.c. Deb.	115—117	100—105	102
181,255	,,	Dec. 13	4	4	Tynemouth 5 p.c. max.	87—89	77—81	...
258,251	Stk.	Aug. 23	5	5	Wandsworth, Wimbledon, and Epsom—	108½—109	89—91d	...
30,000	,,	July 12	8½	9	Wandsworth A 5 p.c.	151—156	132—137	...
255,636	,,	,,	6½	7½	Do. B 3½ p.c.	129—134	110—115	110
108,075	,,	,,	5/17/3	6 6/10	Do. C.	110—115	98—103	...
140,865	,,	,,	—	6 6/10	New Ordinary	..	..	...
352,000	,,	,,	6½	7½	Wimbledon 5 p.c.	117—122	105—110	...
98,000	,,	,,	6½	7½	Epsom 5 p.c.	121—126	110—115	...
88,416	,,	Dec. 28	5	3	3 p.c Deb. Stk.	66—69	56—61*	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *s.*—Sheffield. * Ex div.

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